

FIG. 6A

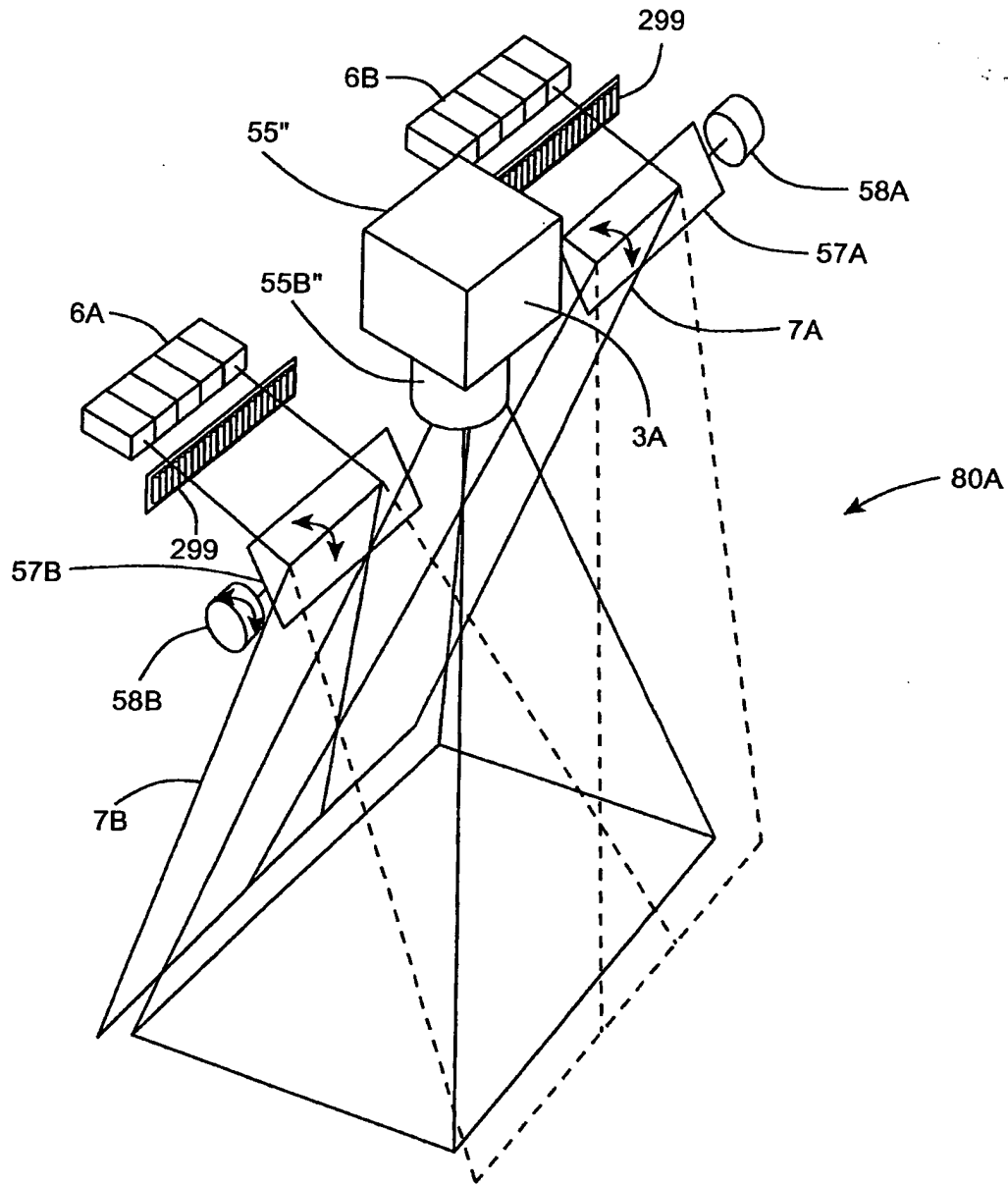


FIG. 6B1

- (1) Variable Focal Length Camera Lens
- (2) Variable Focal Distance

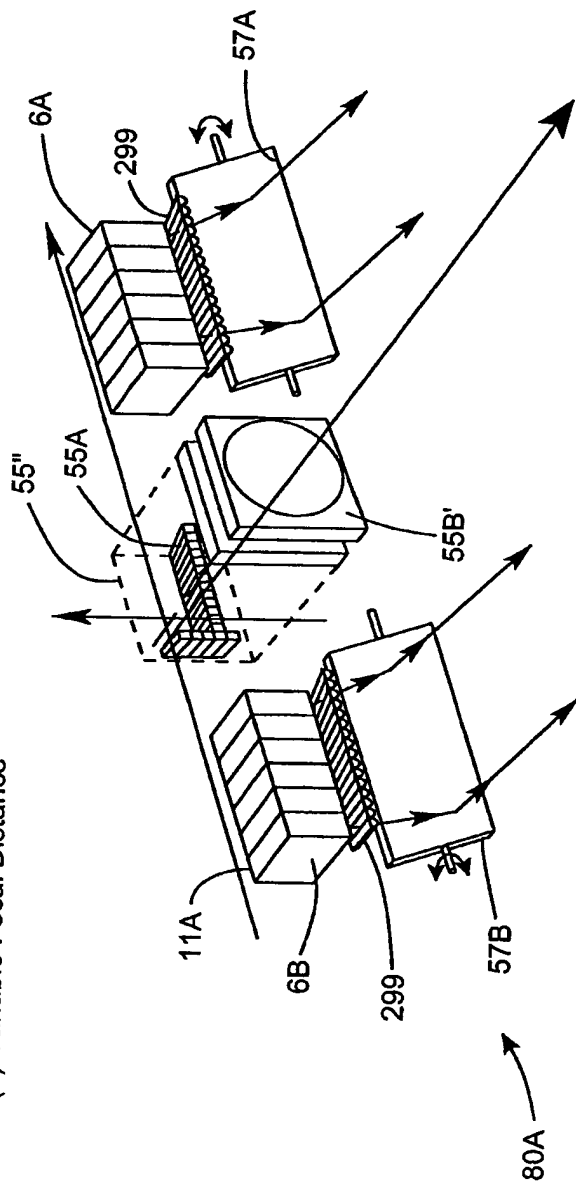


FIG. 6B2

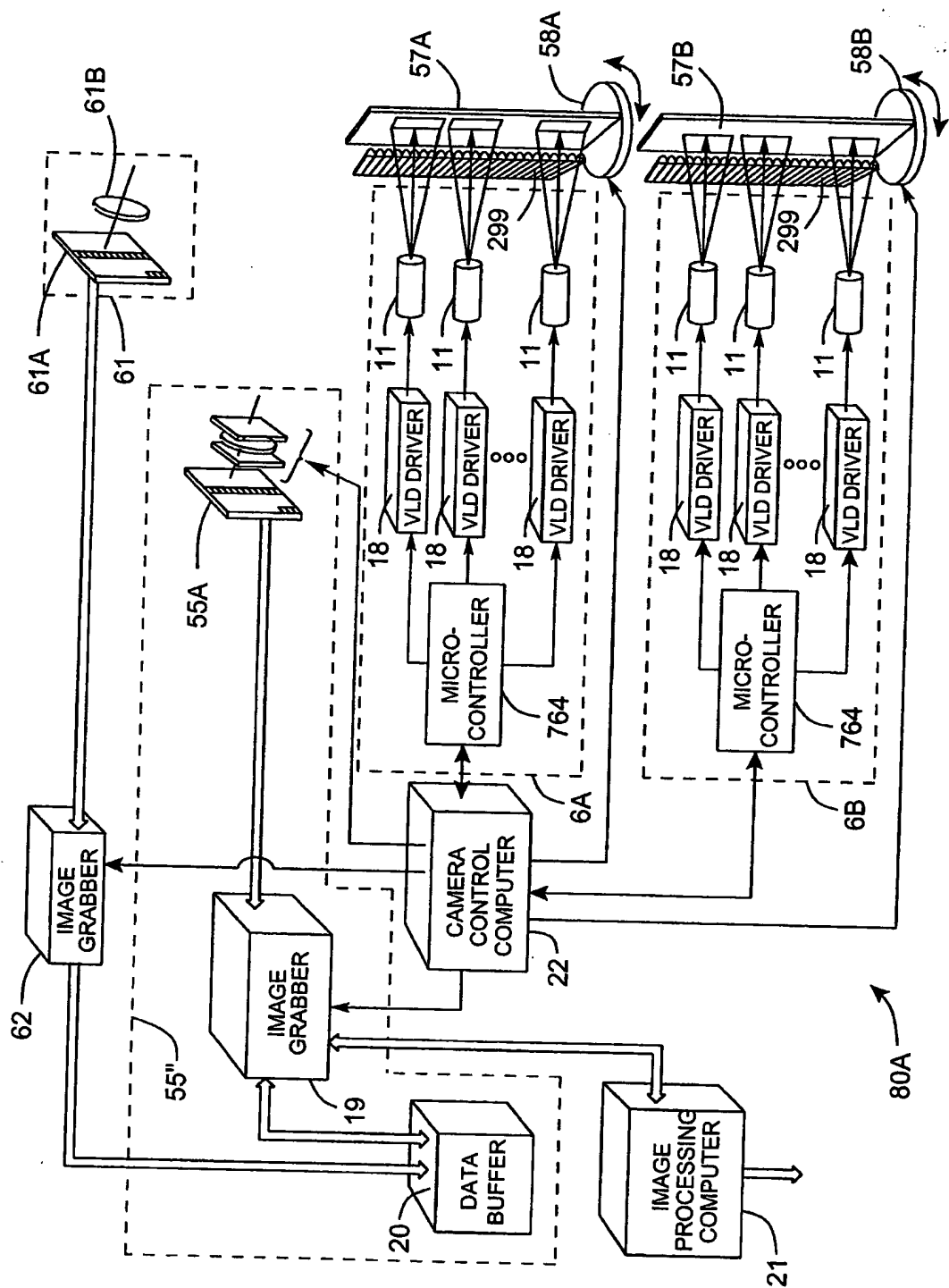


FIG. 6B3

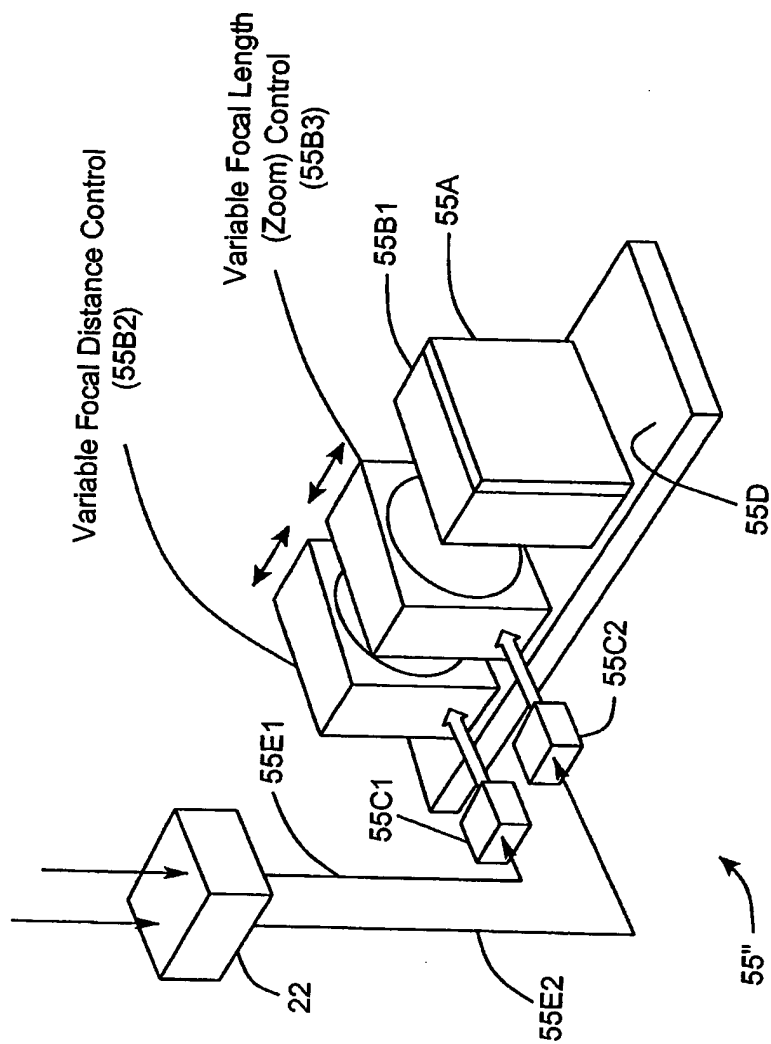


FIG. 6B4

10067540.07093
2006020704525001

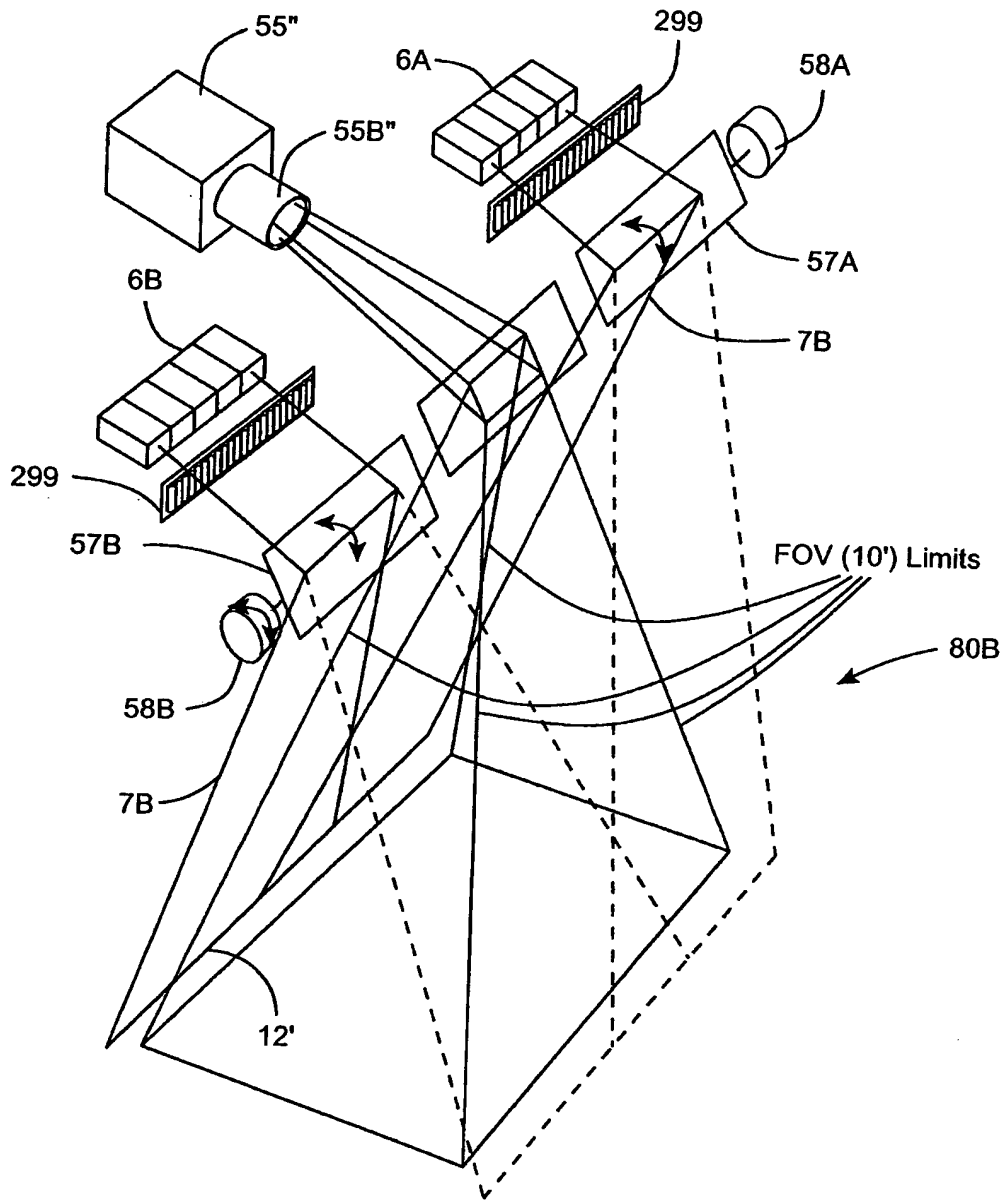


FIG. 6C1

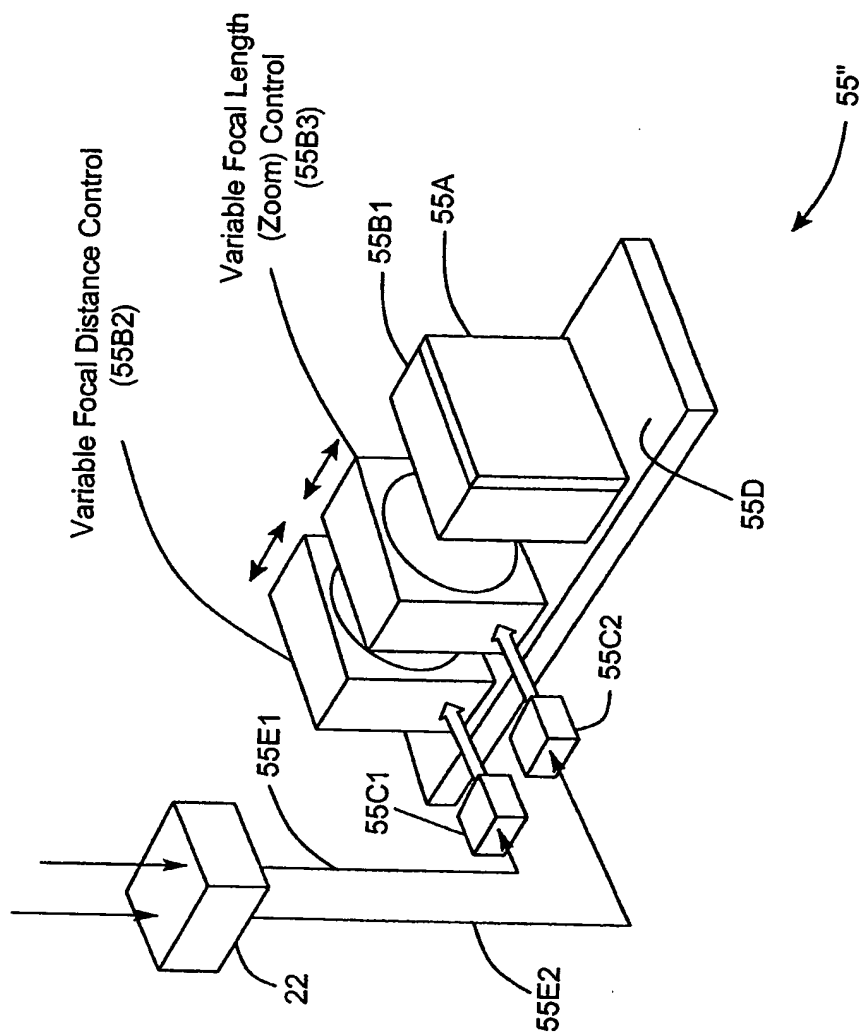


FIG. 6C4

2025-04-20 04:32:30

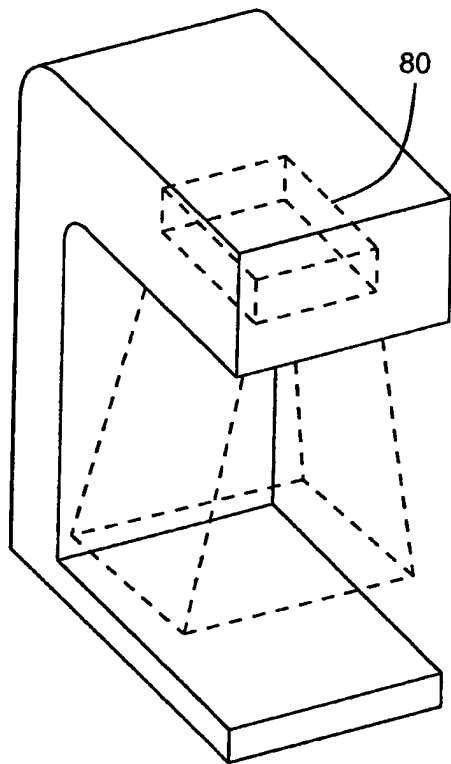


FIG. 6C5

FIG. 6D1

10067540.020002

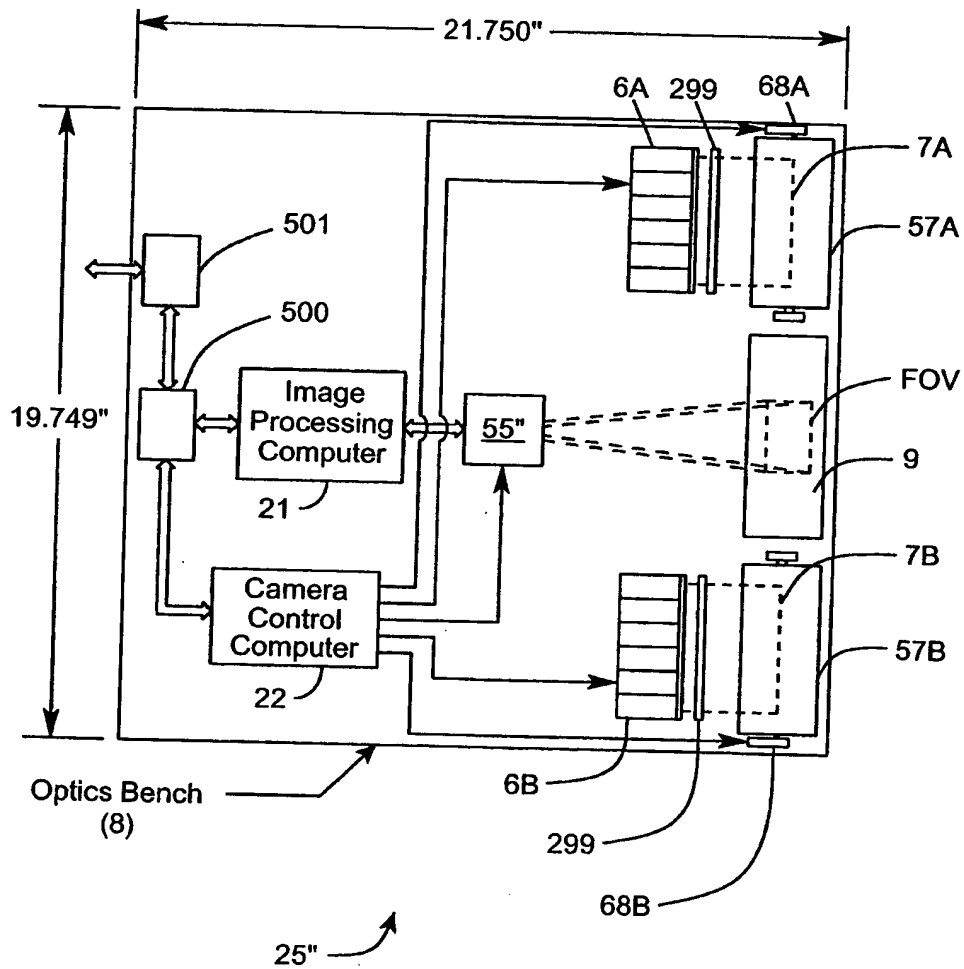


FIG. 6D2

1006540.070001

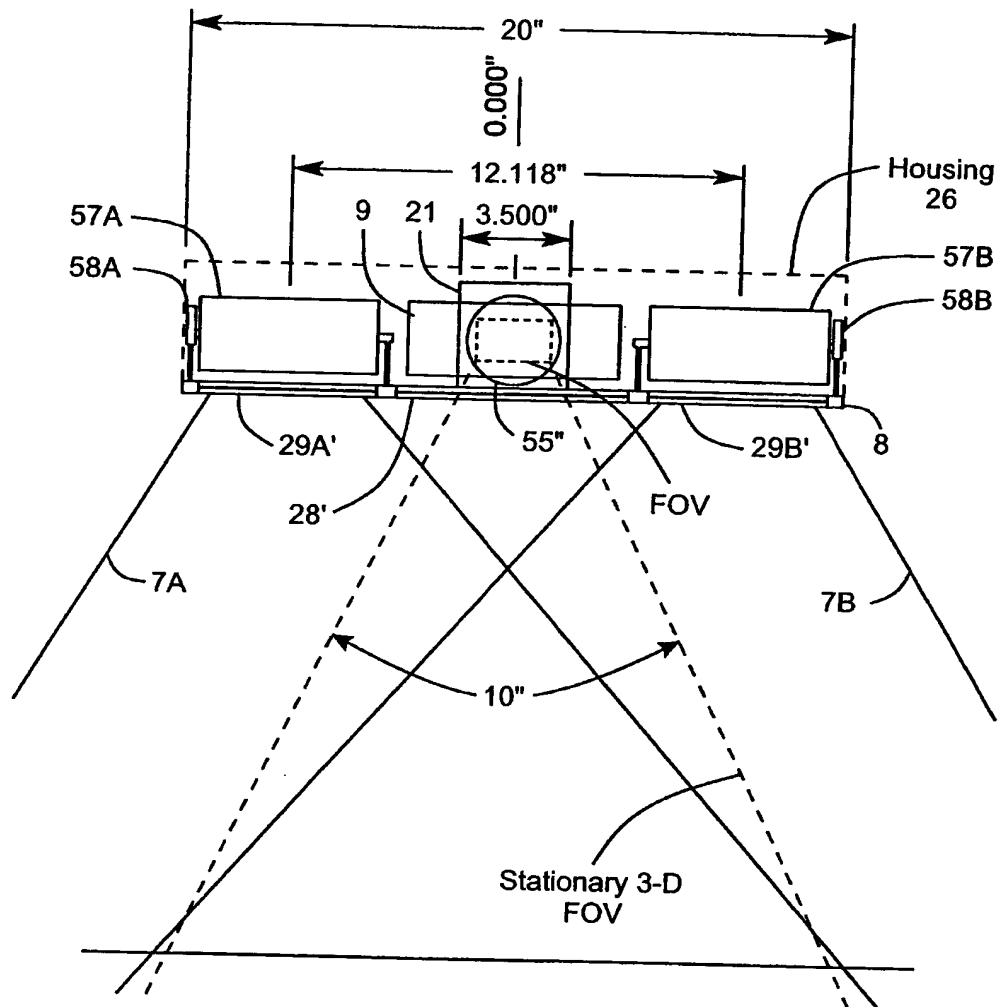


FIG. 6D3

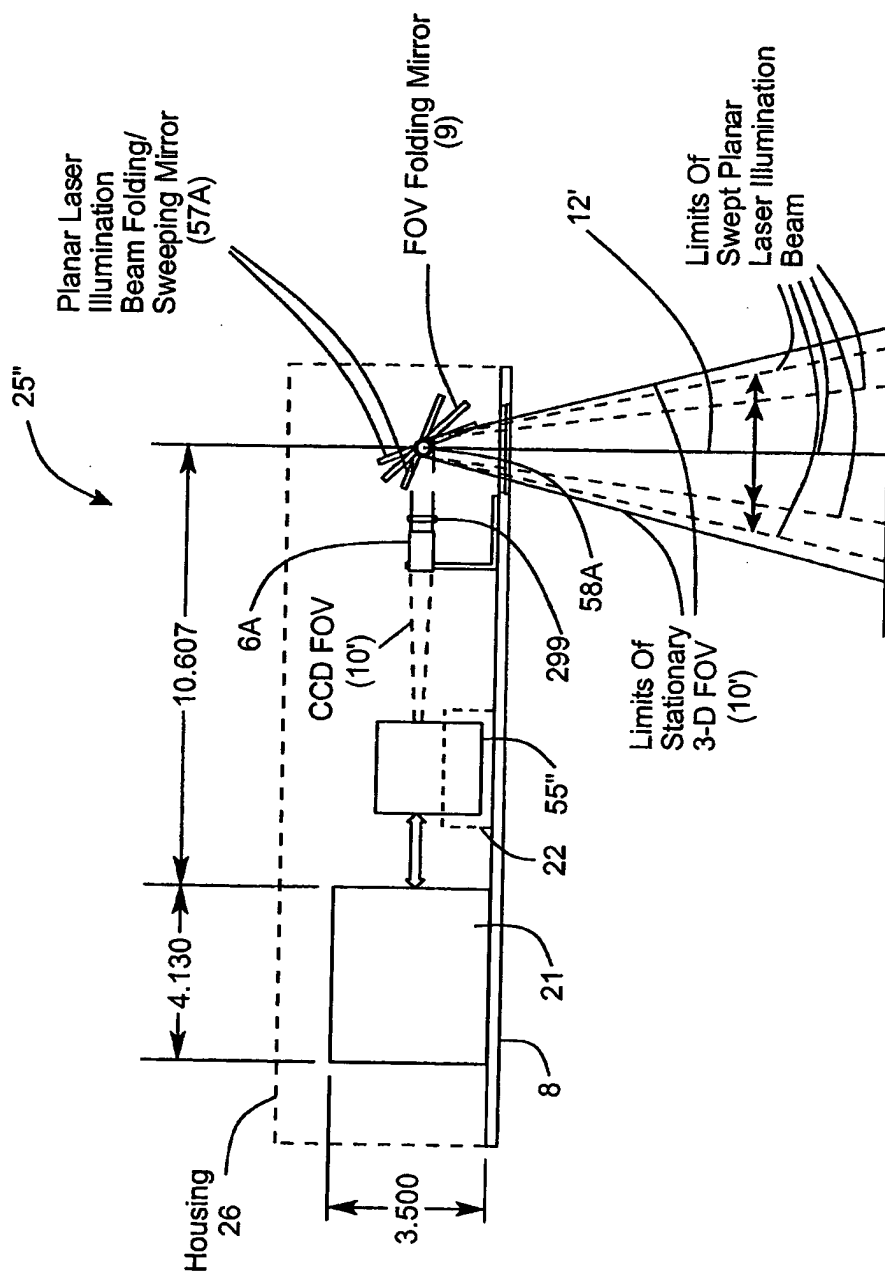
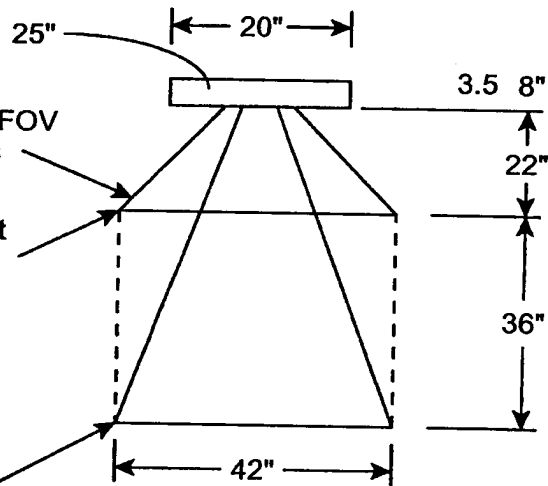


FIG. 6D4



Some of the most important factors influencing the results of the study are discussed below.

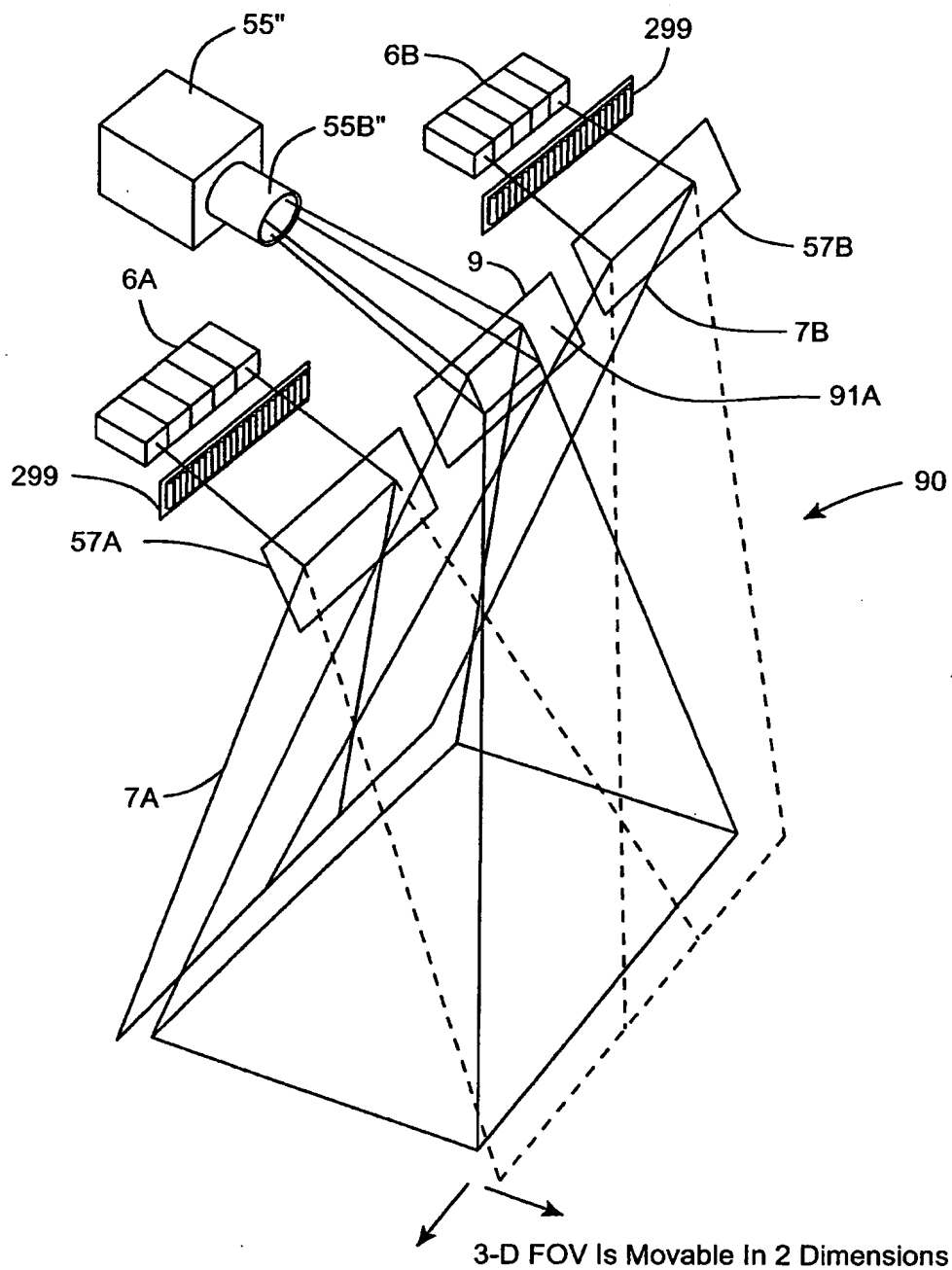


FIG. 6E1

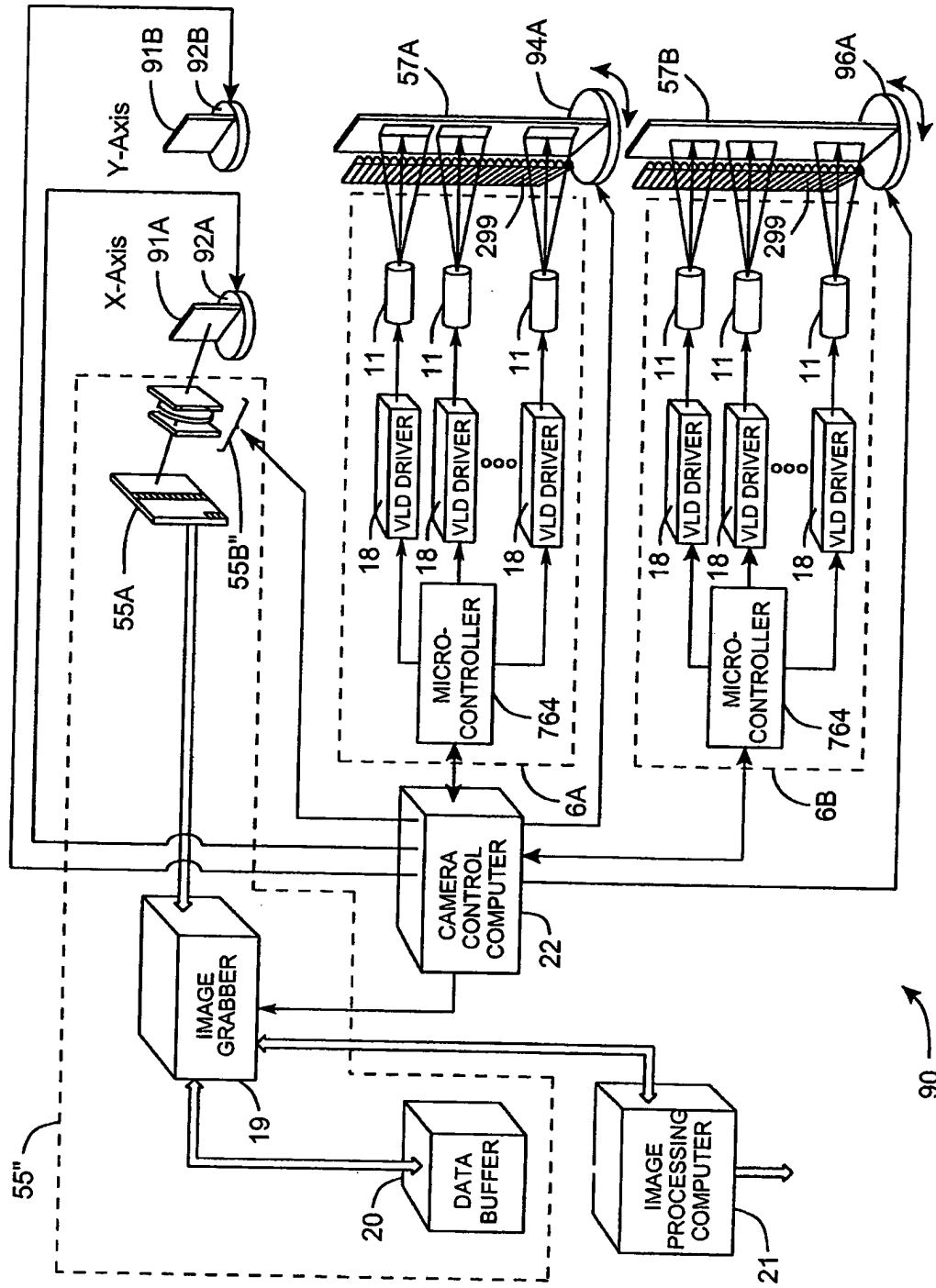


FIG. 6E3

20060207 04523007

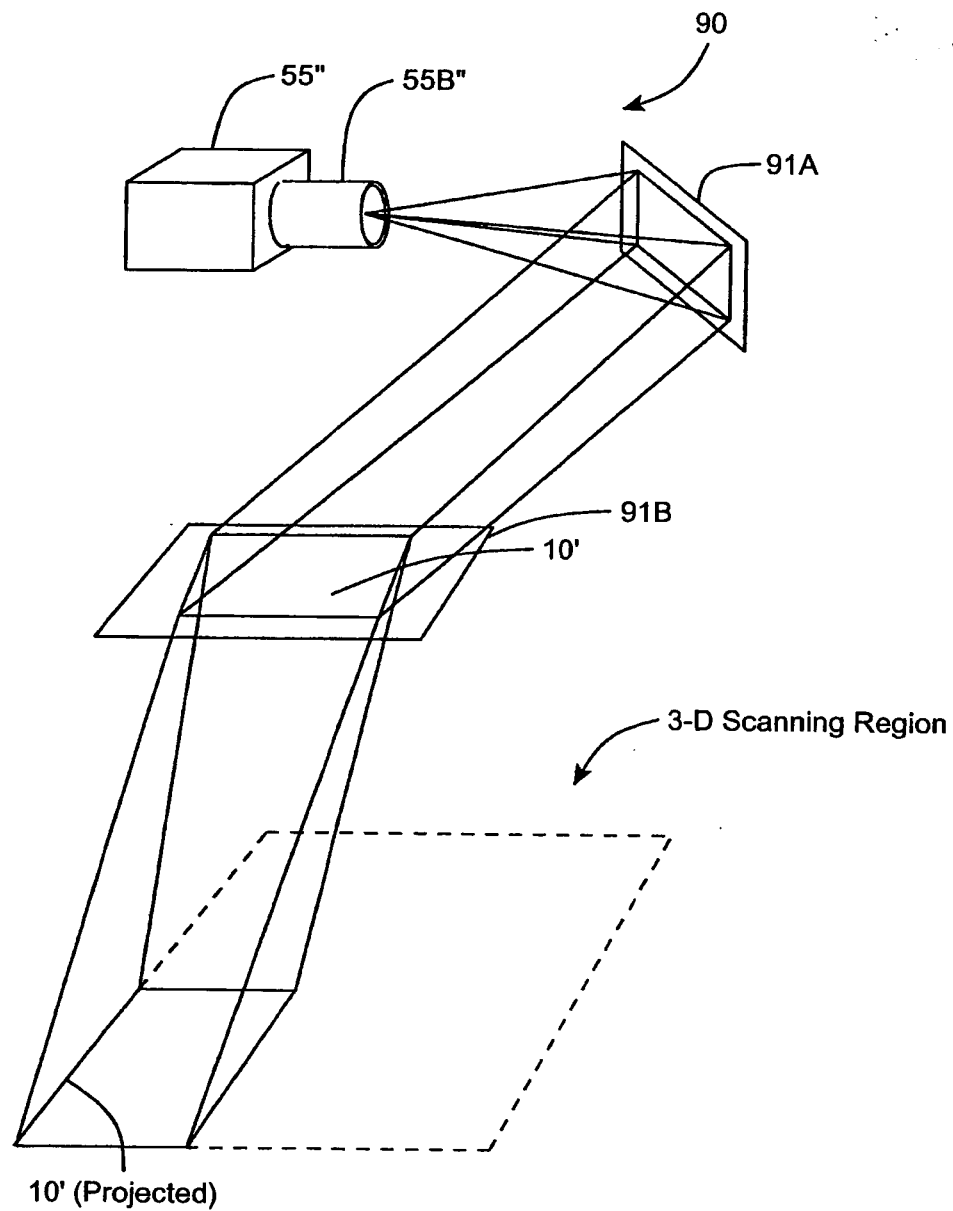


FIG. 6E4

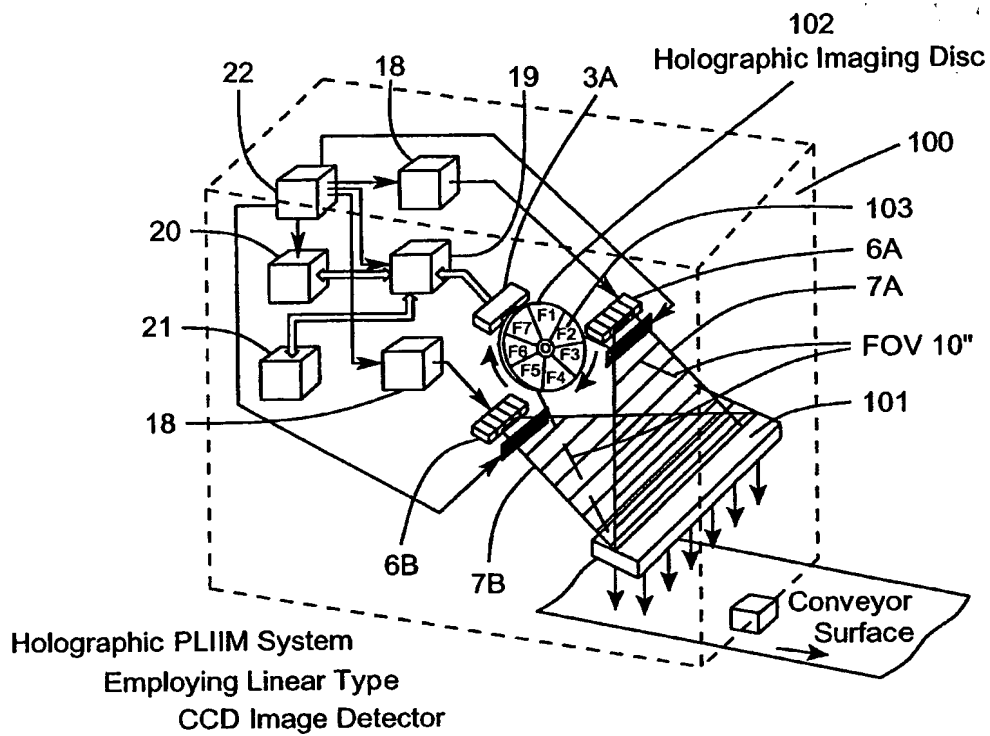


FIG. 7A

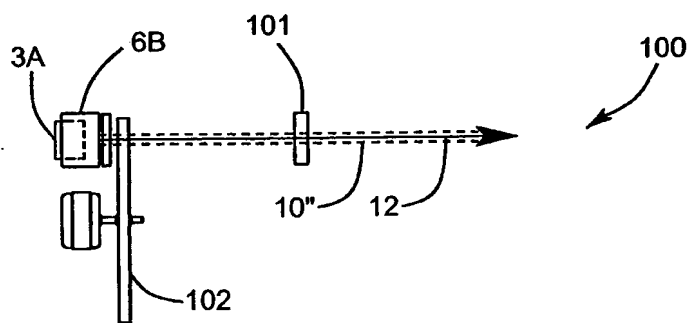


FIG. 7B

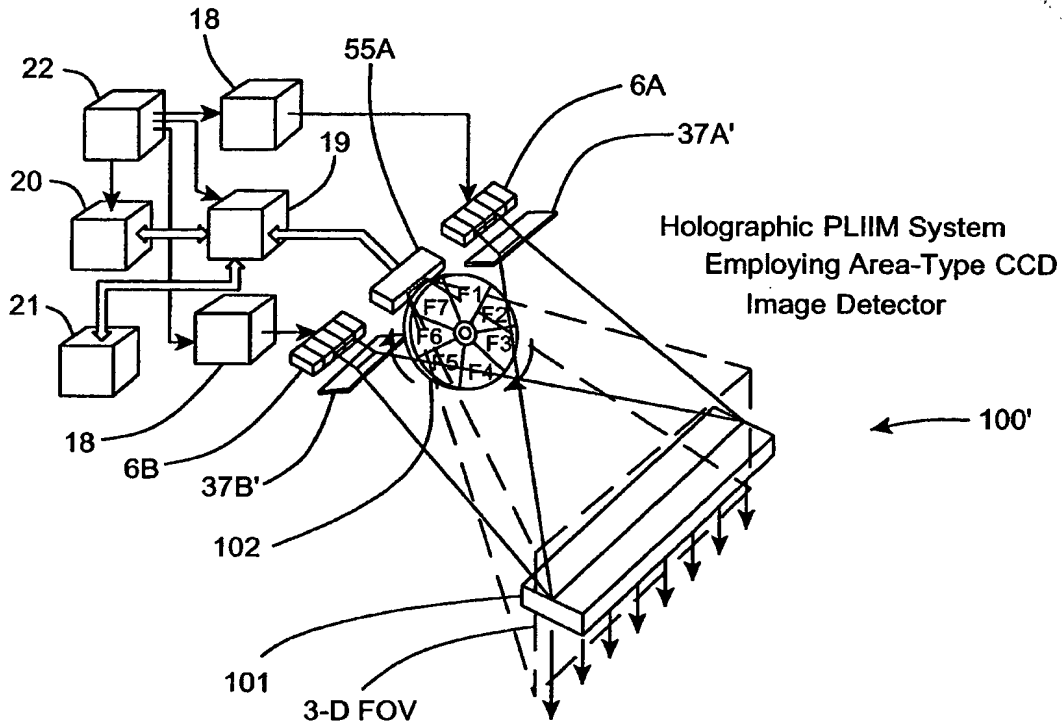


FIG. 8A

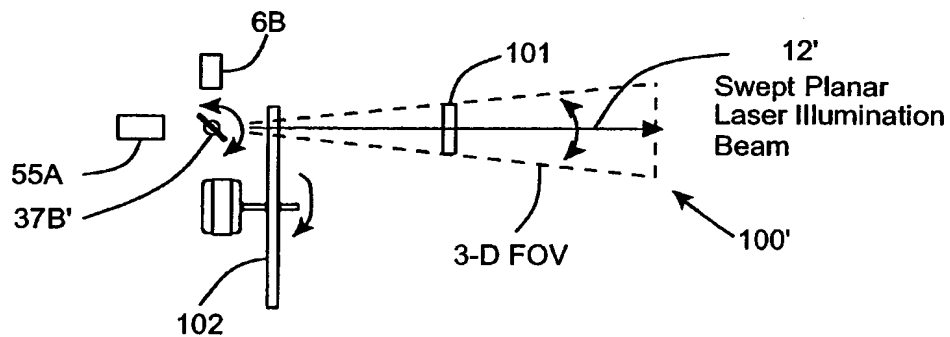


FIG. 8B

1-D Scanner Embodiment

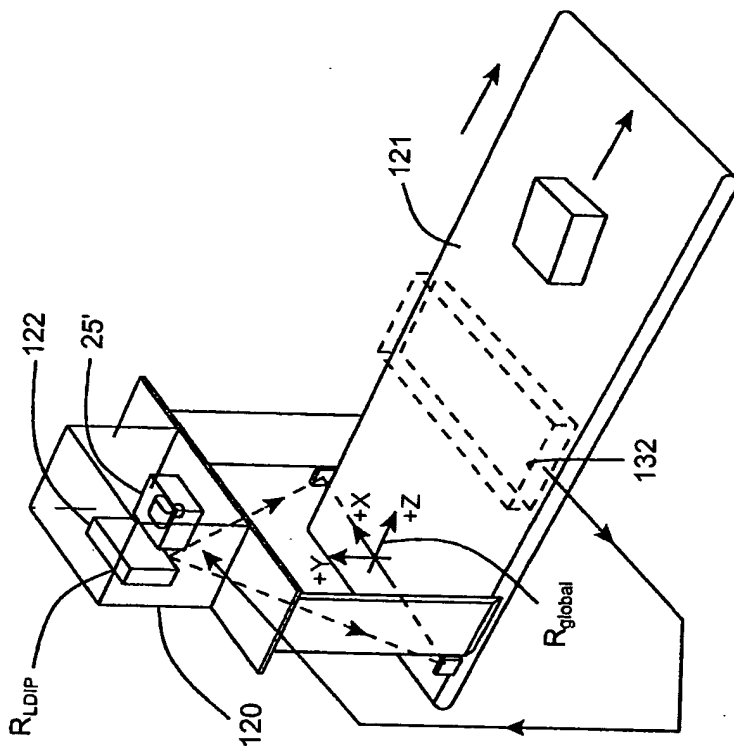


FIG. 9

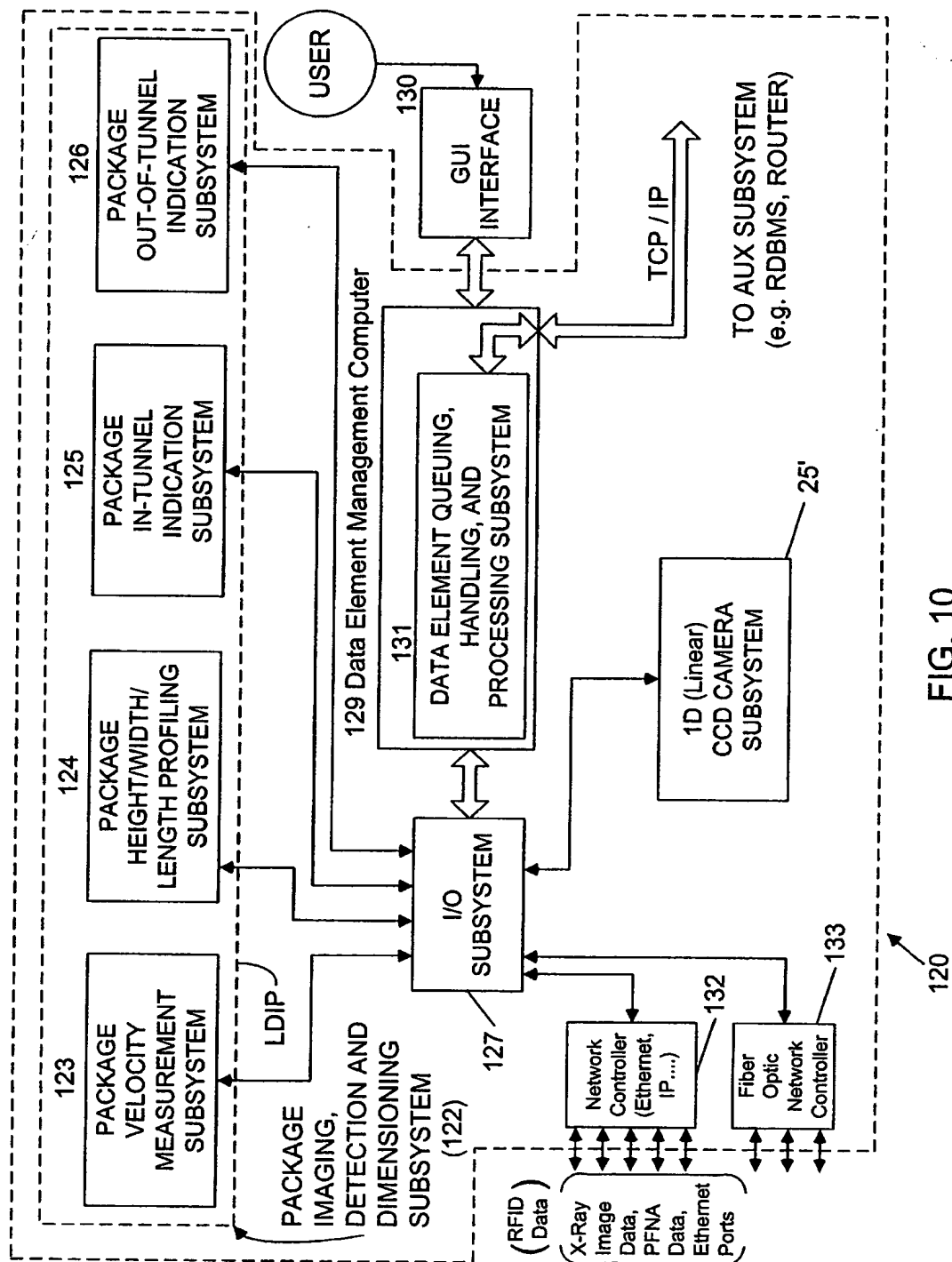


FIG. 10

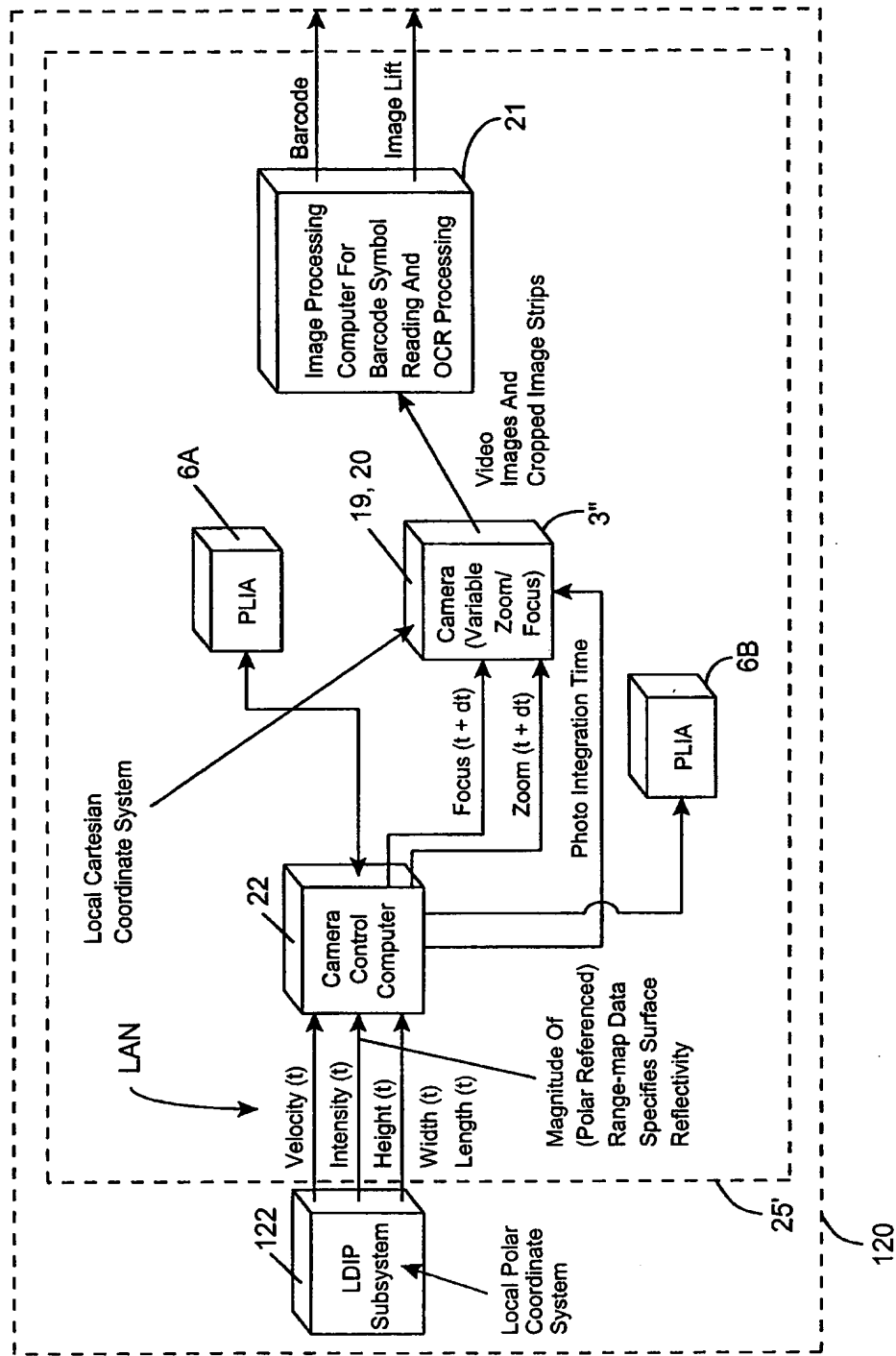


FIG. 11

20060207 04525001

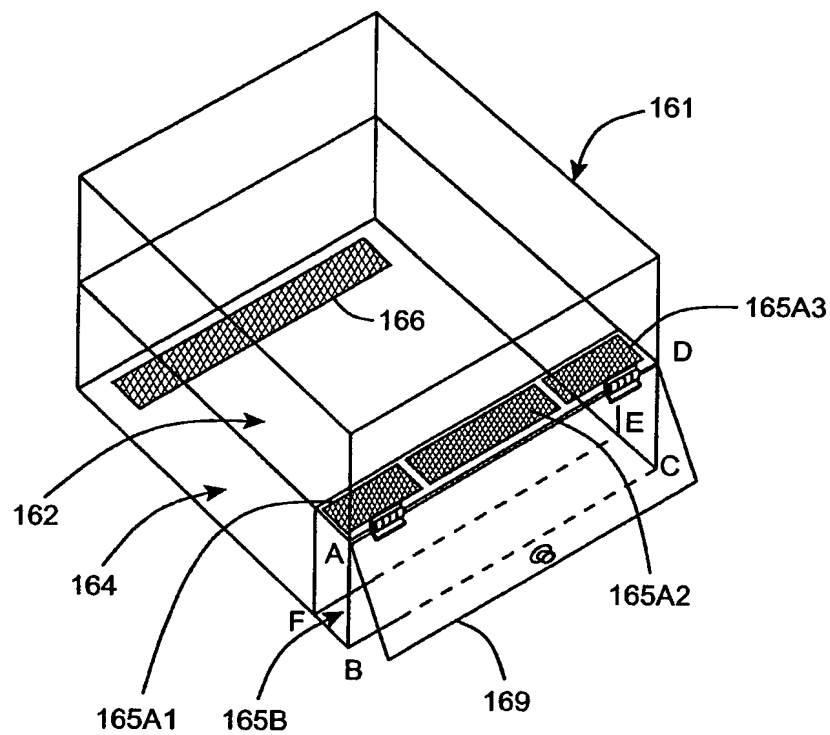


FIG. 12A

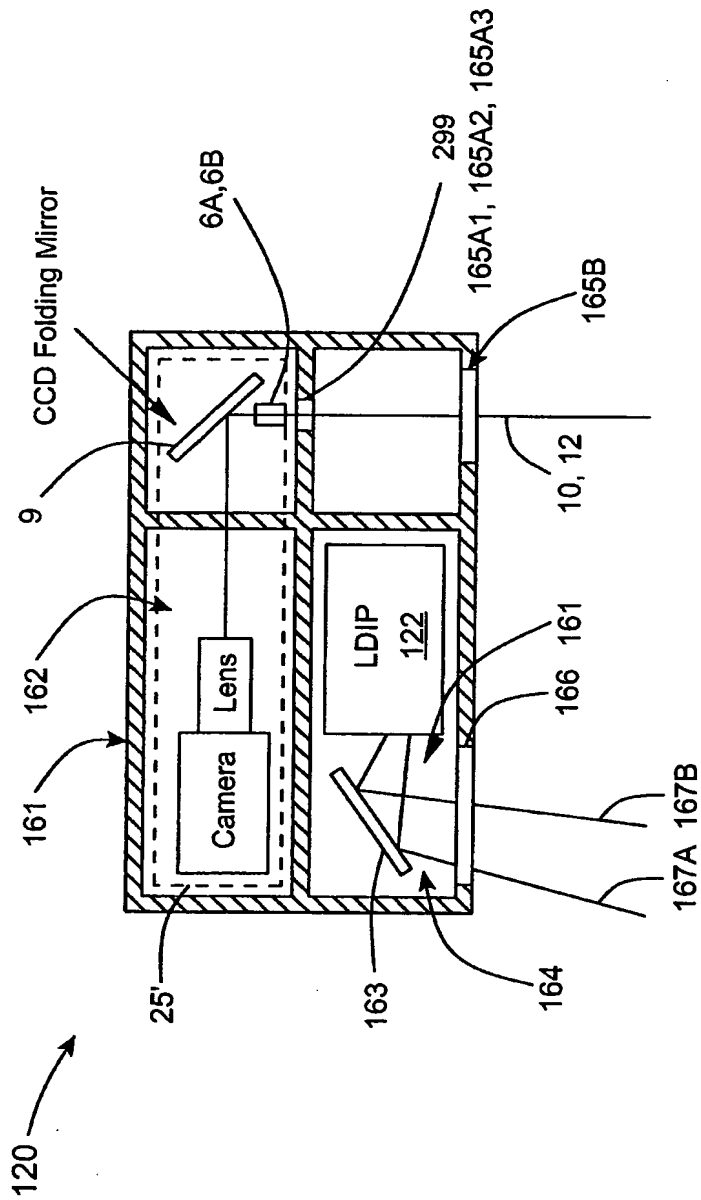


FIG. 12B

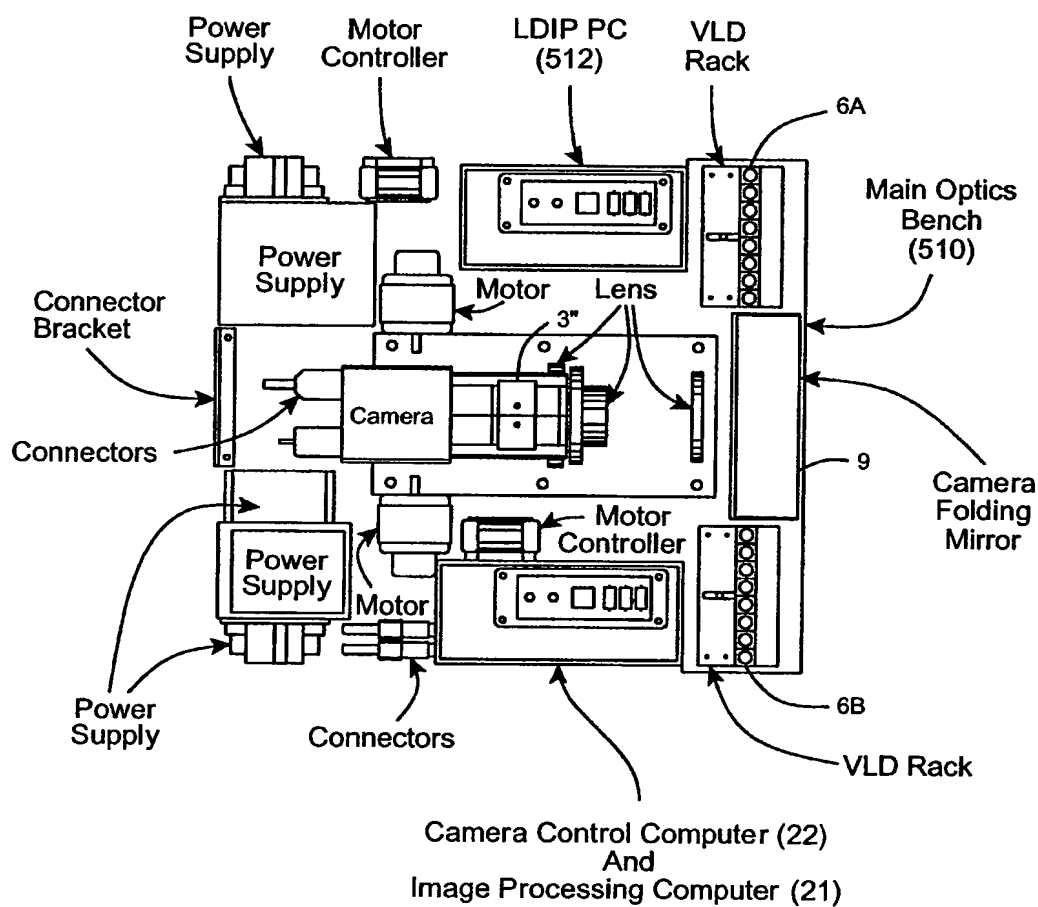


FIG. 12C

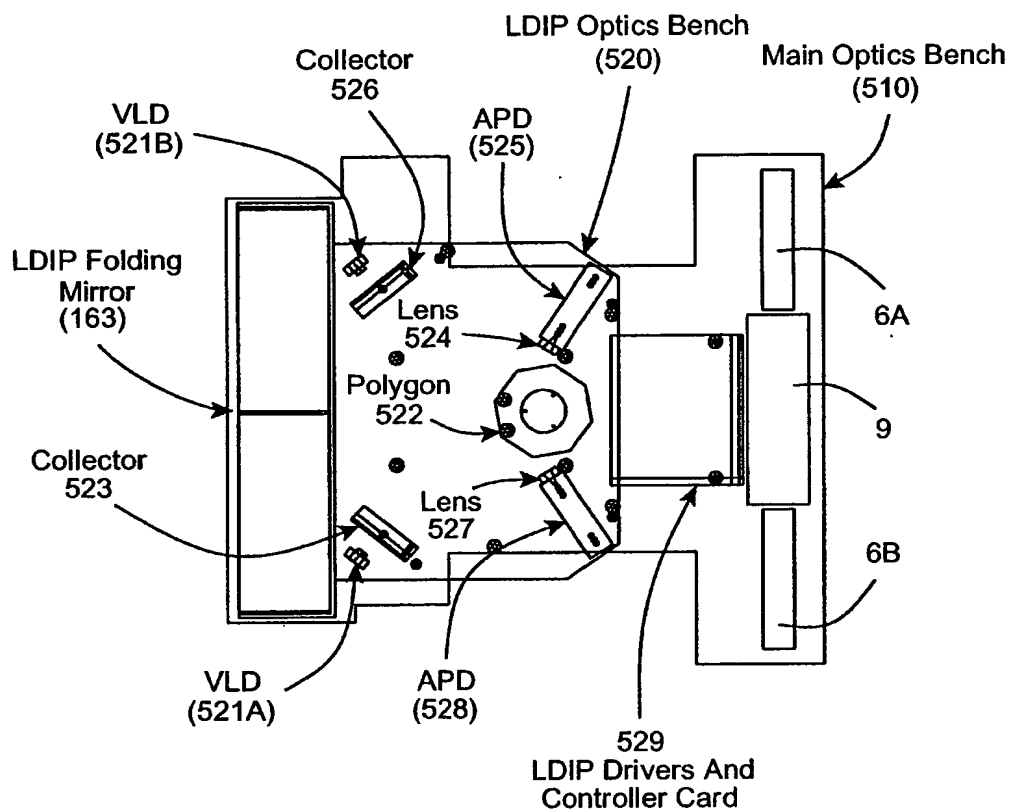
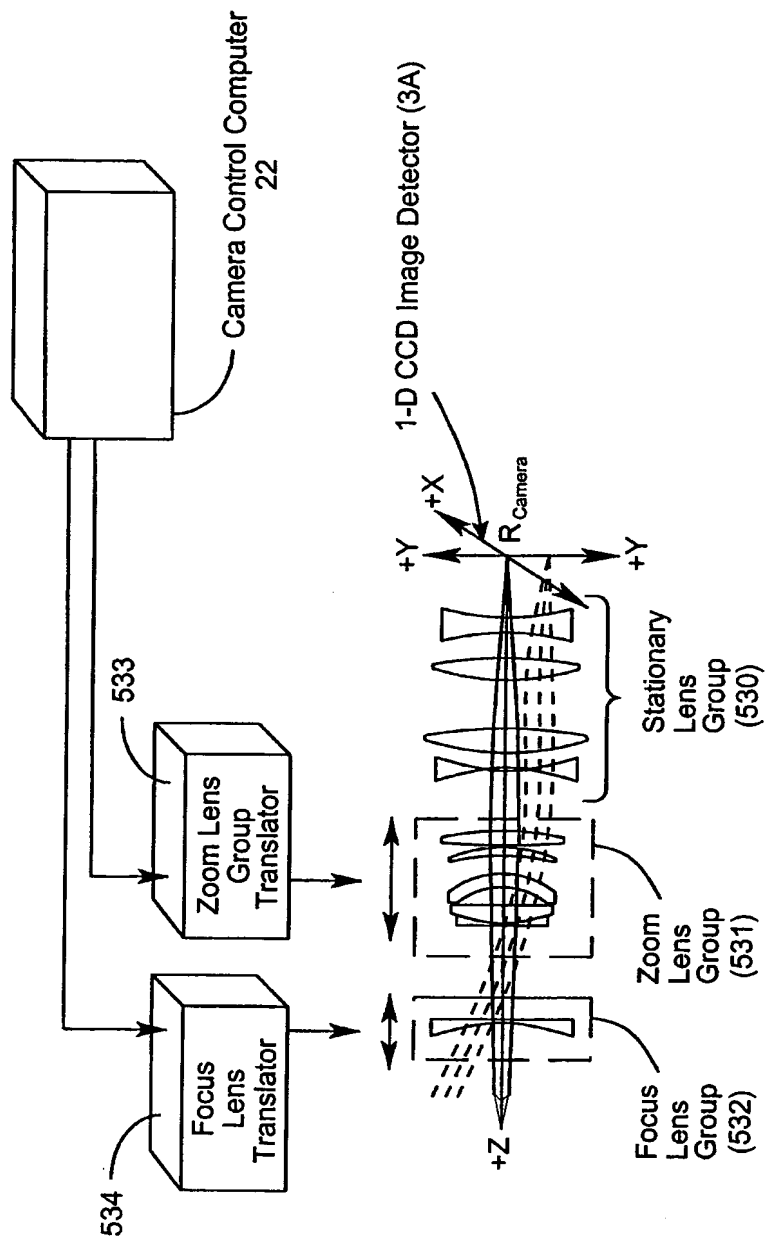


FIG. 12D



Main Optics Lens Groups

FIG. 12E

20250207 04523001

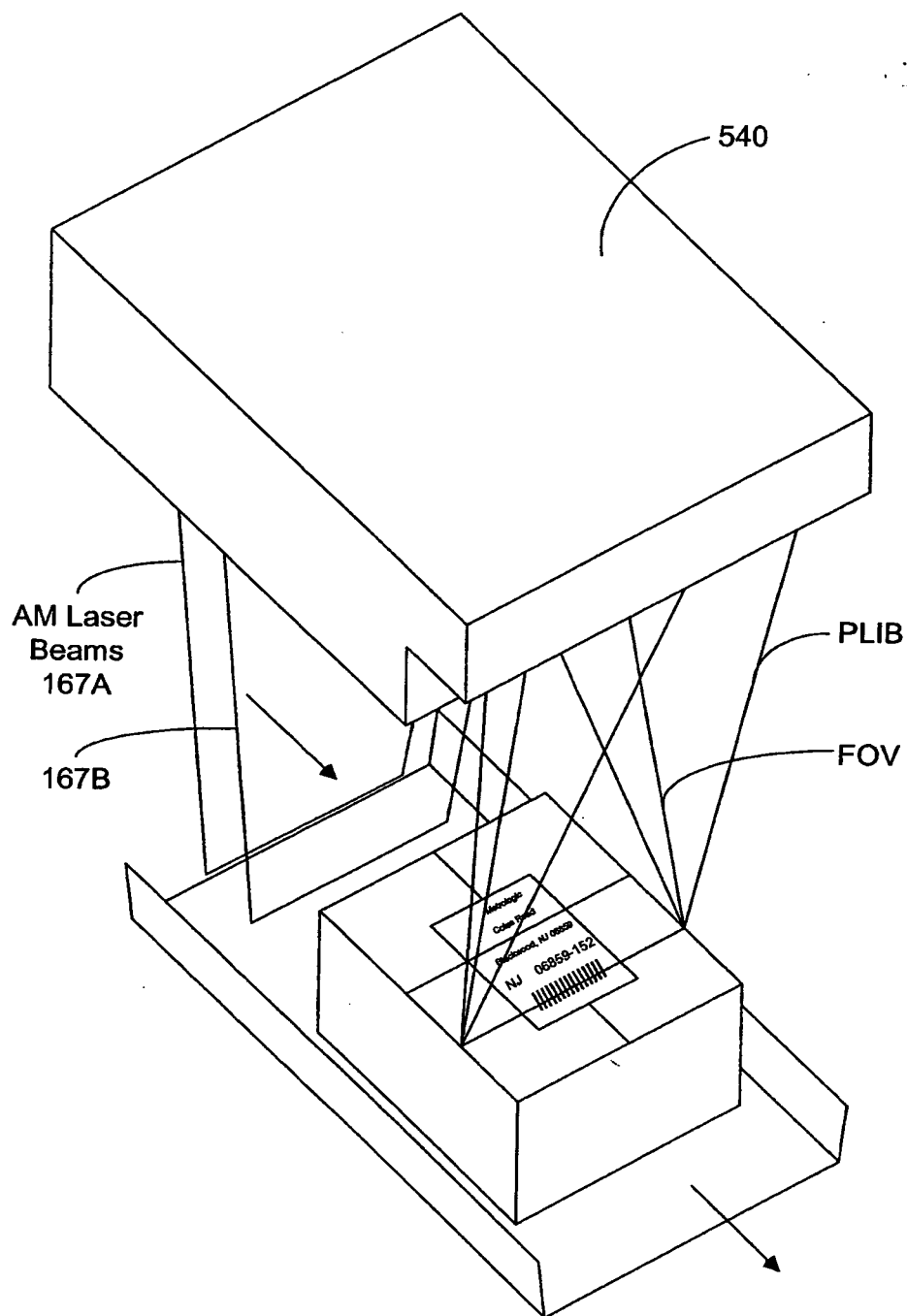


FIG. 13A

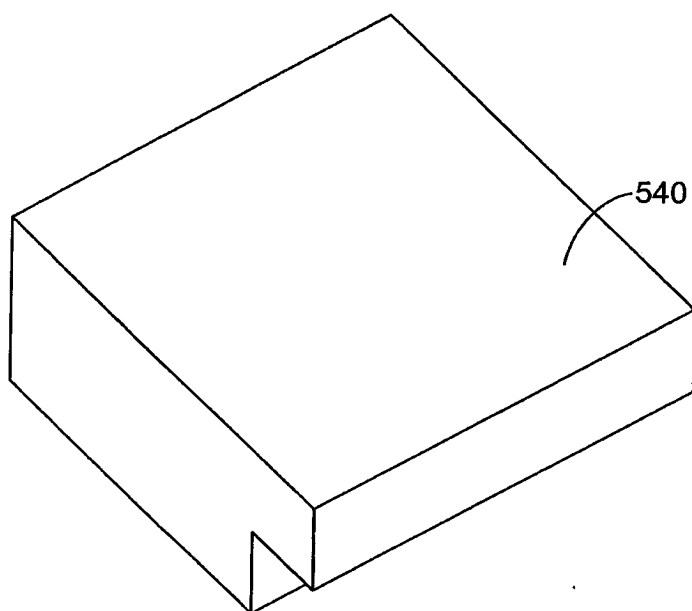


FIG. 13B

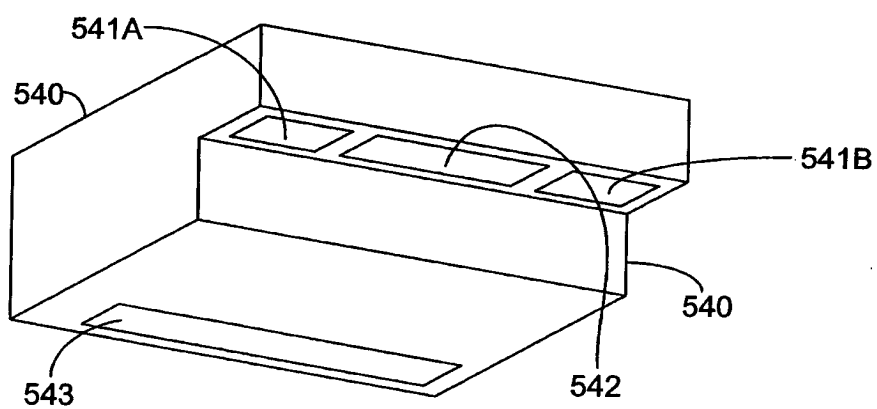


FIG. 13C

PLIIM-BASED PACKAGE IDENTIFICATION AND DIMENSIONING (PID) SYSTEM

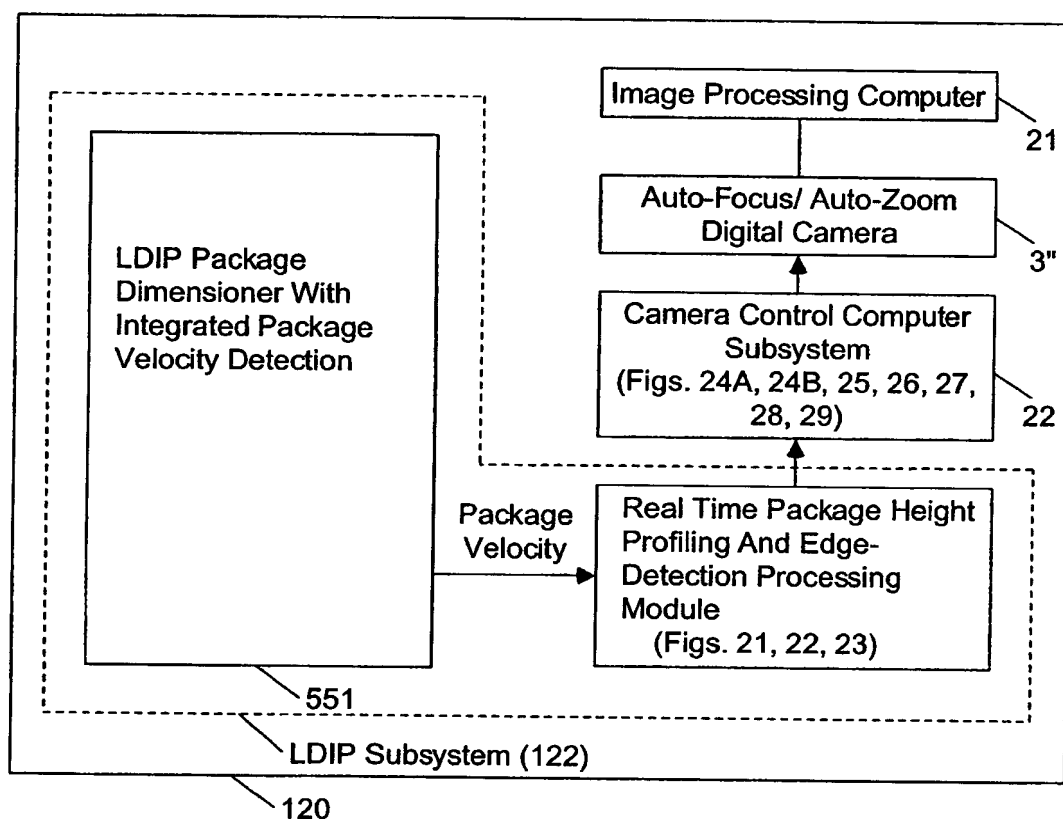


FIG. 14

LDIP REAL-TIME PACKAGE HEIGHT PROFILE AND EDGE DETECTION METHOD

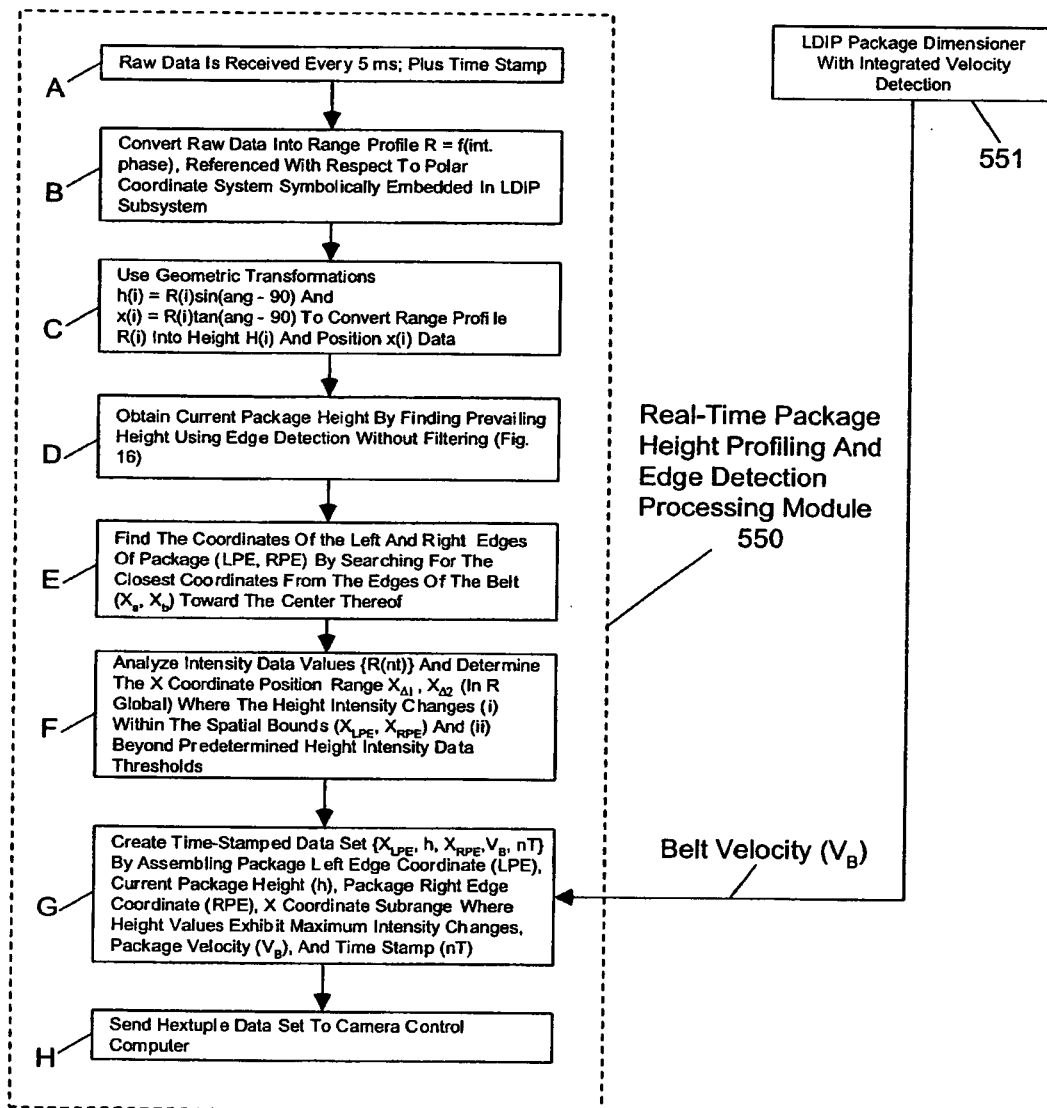
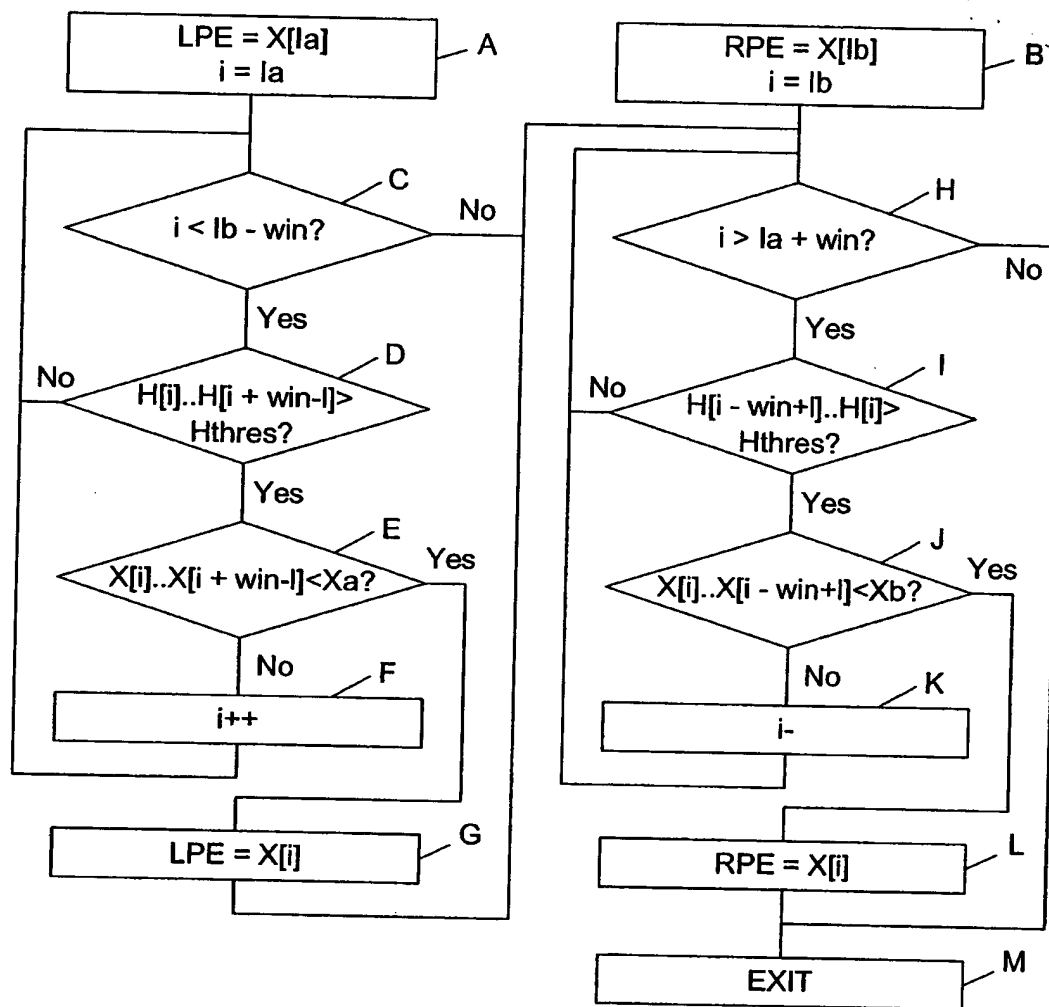


FIG. 15

LDIP REAL-TIME PACKAGE EDGE DETECTION



Xa = Location Of Belt Left Edge; Xb = Location Of Belt Right Edge
 la = Belt Left Edge Pixel; lb = Belt Right Edge Pixel
 LPE = Left package Edge; RPE = Right Package Edge
 H[] = Pixel Height Array; X[] = Pixel Location Array
 win = Package detection Window

FIG. 16

10067540.070902

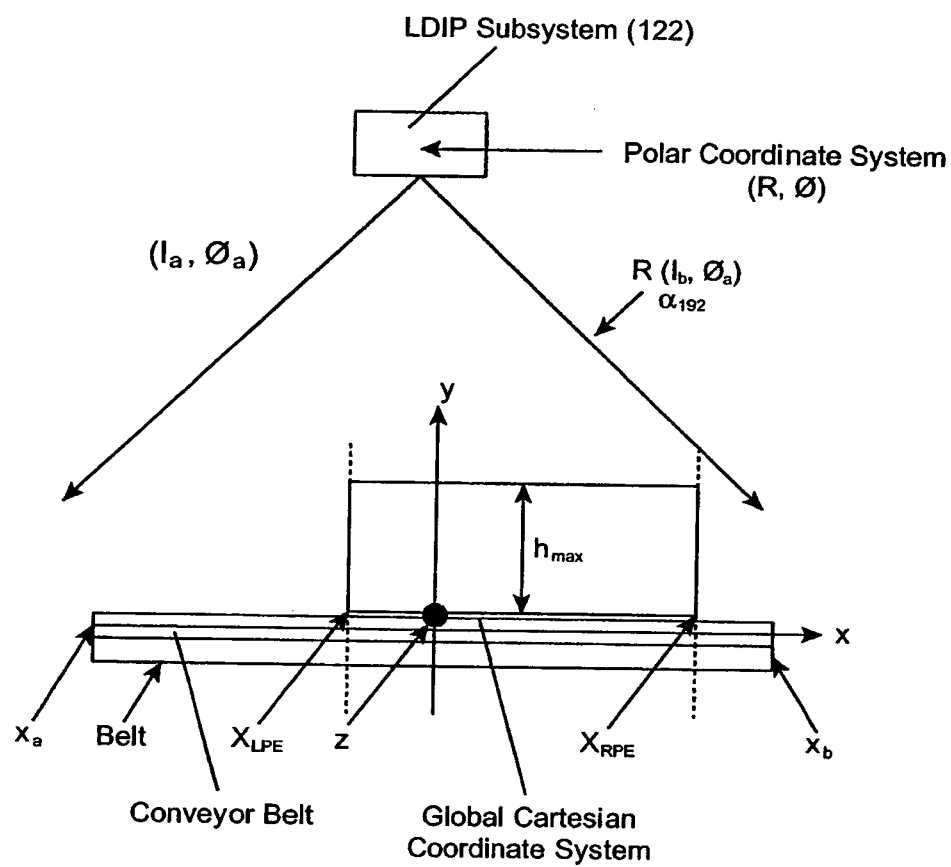


FIG. 17

Information Measured At Scan Angles Before
Coordinate Transformations

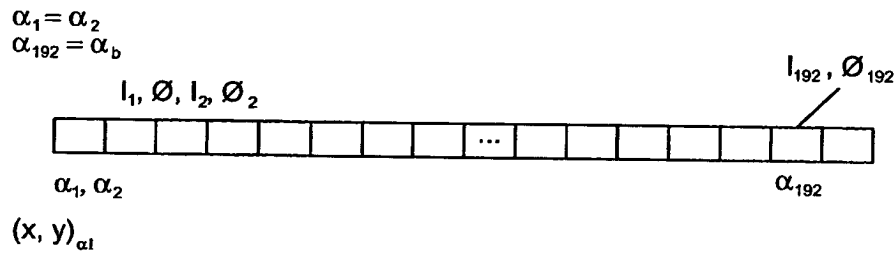


FIG. 17A

Range And Polar Angle Measures Taken At Scan
Angle α Before Coordinate Transforms

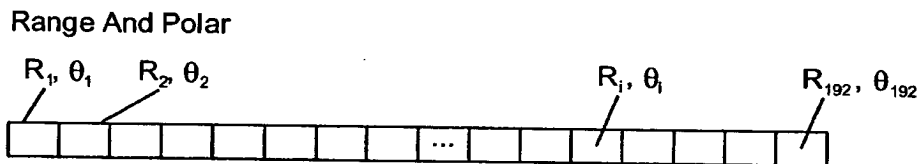


FIG. 17B

Measured Package Height And Position Values
After Coordinate Transformations

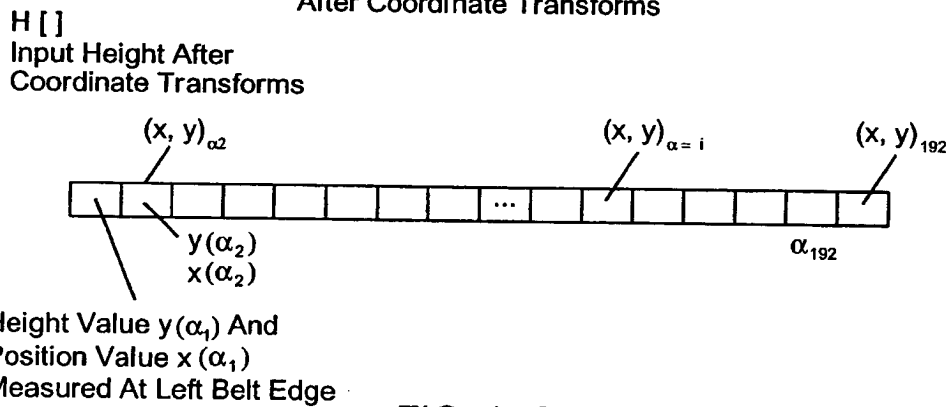


FIG. 17C

CAMERA CONTROL PROCESS CARRIED OUT WITHIN THE CAMERA
CONTROL SUBSYSTEM OF EACH OBJECT IDENTIFICATION AND
ATTRIBUTE ACQUISITION SYSTEM OF PRESENT INVENTION

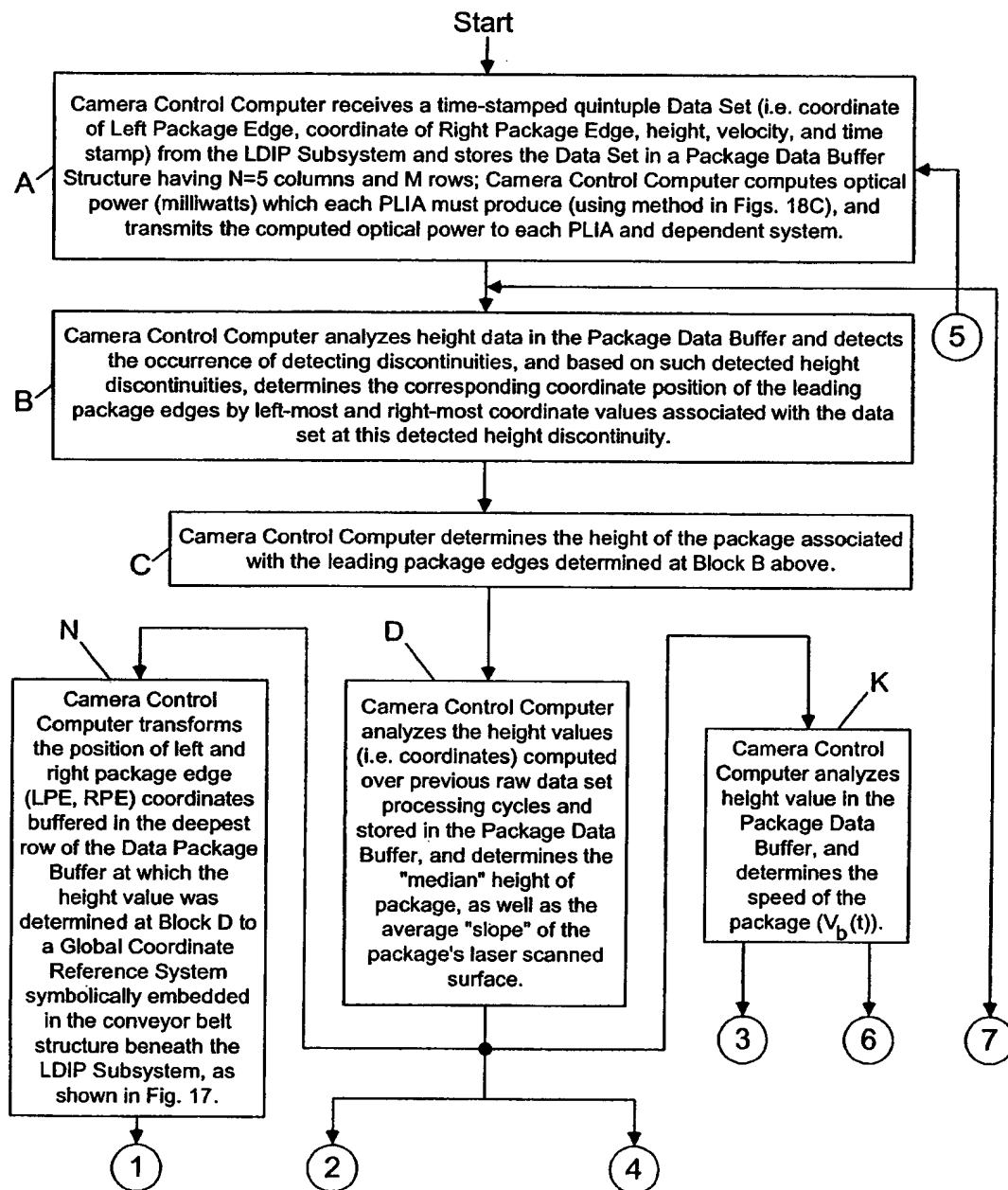


FIG. 18A

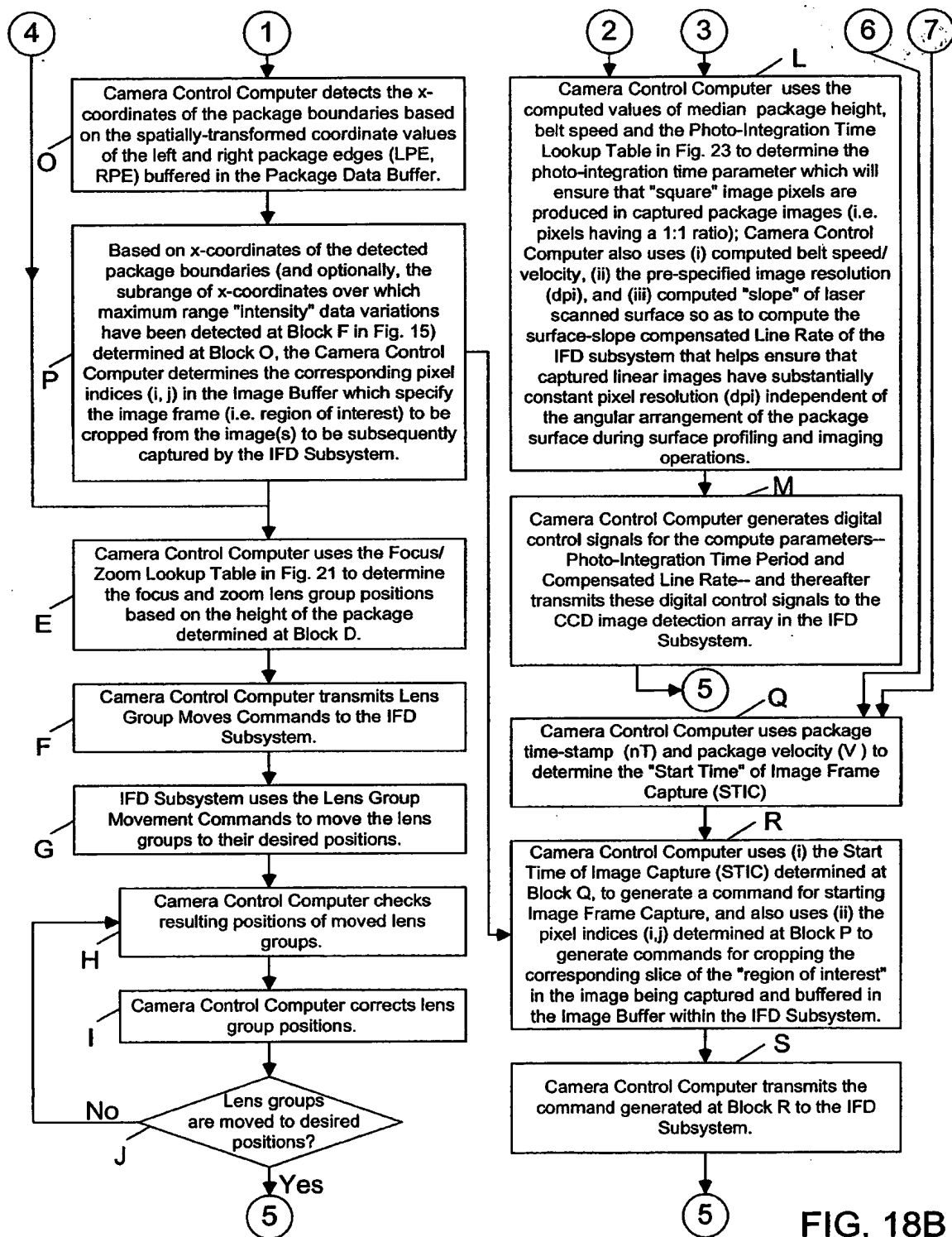


FIG. 18B

METHOD OF COMPUTING OPTICAL OUTPUT POWER FROM LASER
DIODES IN A PLANAR LASER ILLUMINATION ARRAY (PLIA) FOR
CONTROLLING THE CONSTANT WHITE-LEVEL IN IMAGE PIXELS
CAPTURED BY A PLIIM-BASED LINEAR IMAGER

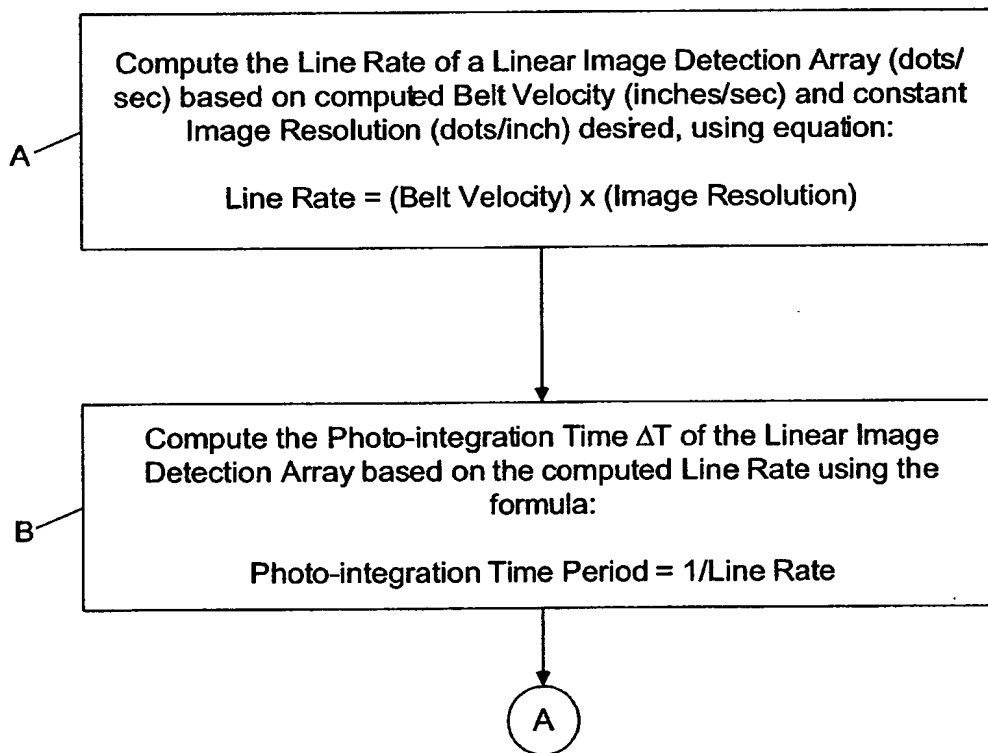


FIG. 18C1

4003403001

A



Compute the Optical Power (milliwatts) of each PLIA based on the computed Photo-integration Time Period (ΔT) using the following formula:

$$\text{Optical Power of VLD (milliwatts)} = \frac{\text{constant}}{\text{Photo-integration Time Period } \Delta T}$$

FIG. 18C2

**X Coordinate Subrange Where
Maximum Range "Intensity"
Variations Have Been Detected**

Left Package Edge (LPE)	Package Height (h)	Right Package Edge (RPE)	Package Velocity	Time-Stamp (nT)	
					Row 1
					Row 2
					Row 3
					Row 4
					Row 5
					Row M

Package Data Buffer (FIFO)

FIG. 19

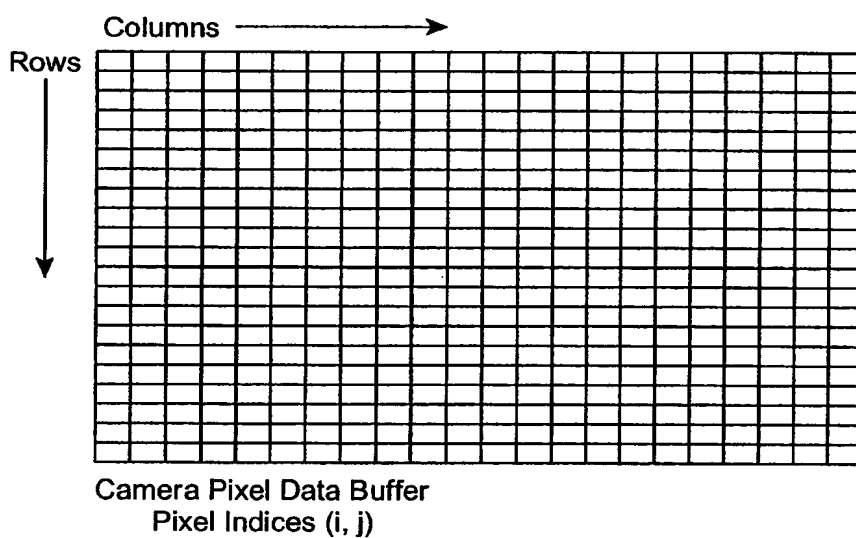


FIG. 20

Zoom And Focus Lens Group Position
Look-Up Table

Distance From Camera H (mm)	Zoom Group Distance (mm) Y (Zoom)	Focus Group Distance (mm) Y (Focus)
1000	21.57489228	2.47E-05
1100	19.38089696	10.98009783
1200	17.10673434	20.85783177
1300	14.77137314	29.10917002
1400	12.39153565	36.47312595
1500	9.979114358	42.87845436
1600	7.540839114	48.44003358
1700	5.078794775	53.25495831
1800	2.595989366	57.40834303
1900	0.099972739	60.98883615
(Use Interpolation Techniques For Working Distances Between Listed Points In Table)		

FIG. 21

* Note: The focal distance and zoom (eff. focal length) of camera lens are coupled (inter-dependant) in this commercial embodiment.

Camera Has A Fixed Aperture F56

Focus And Zoom Lens Movement vs. Working Distances

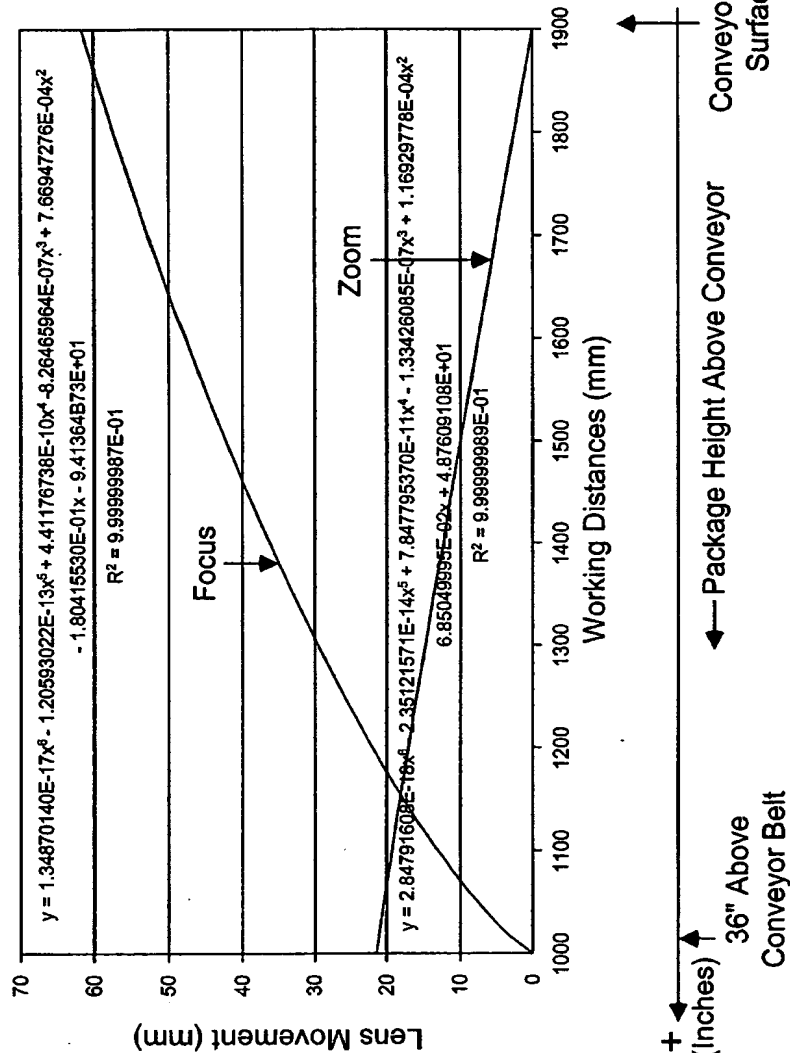


FIG. 22

Photo-Integration Time Look-Up Table

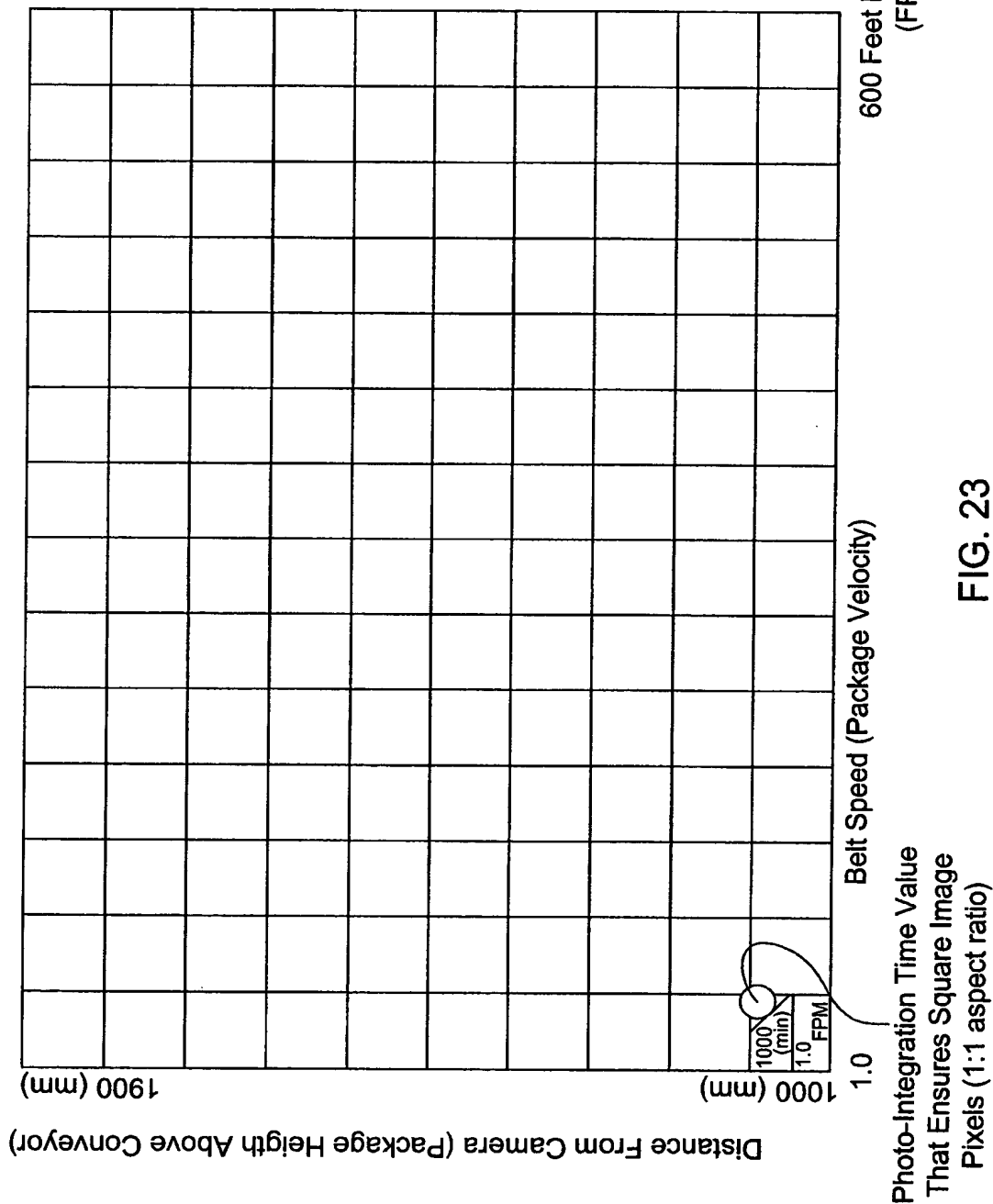


FIG. 23

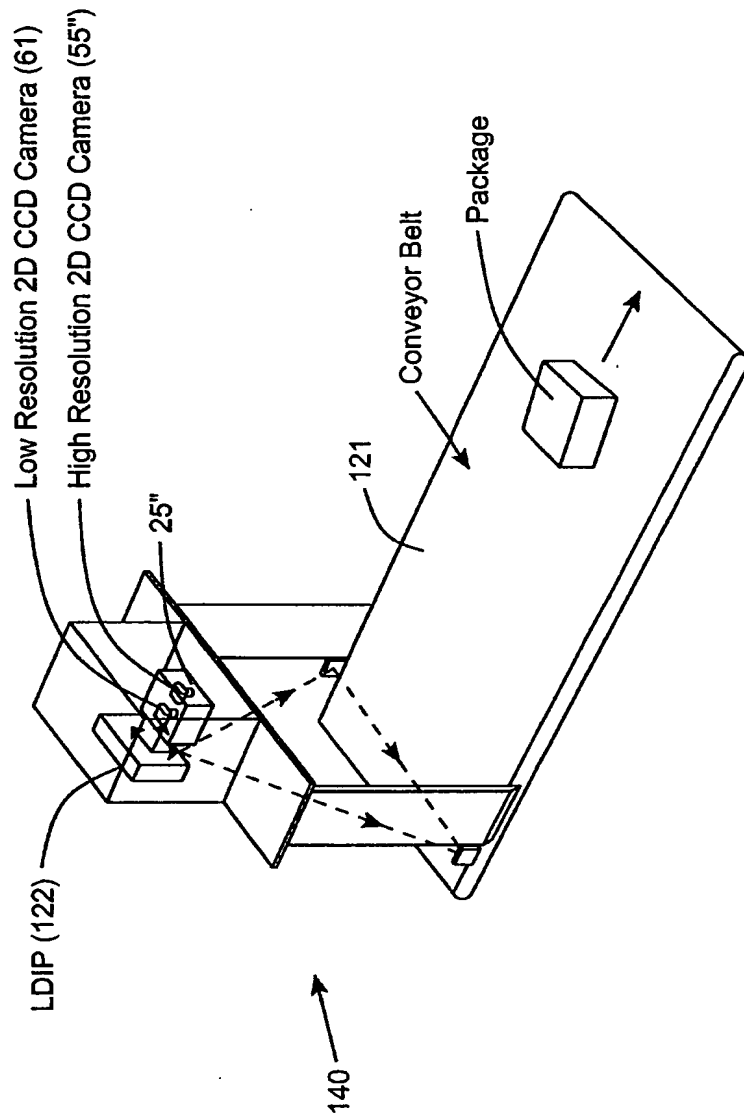
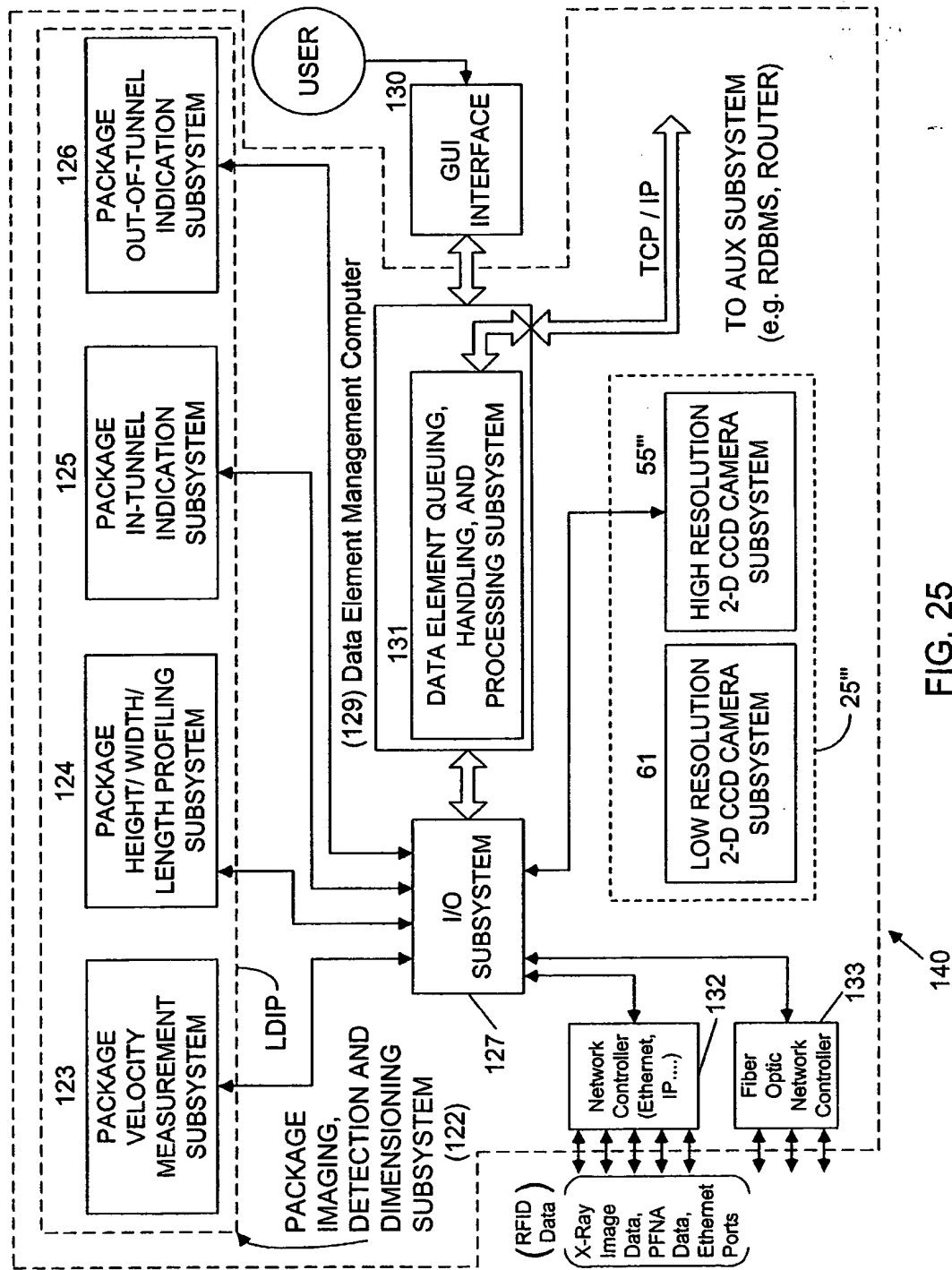


FIG. 24



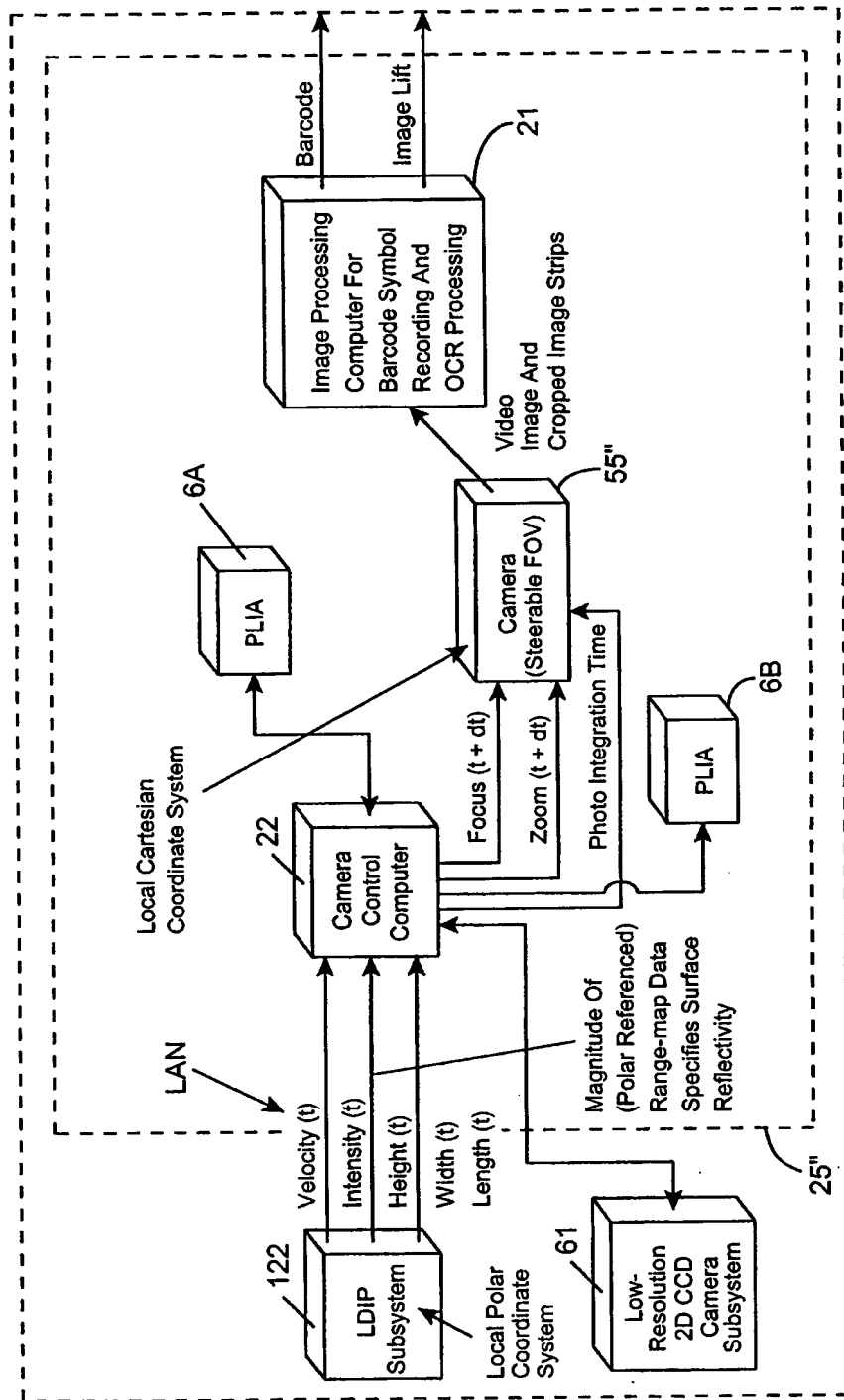


FIG. 26

2006020452901

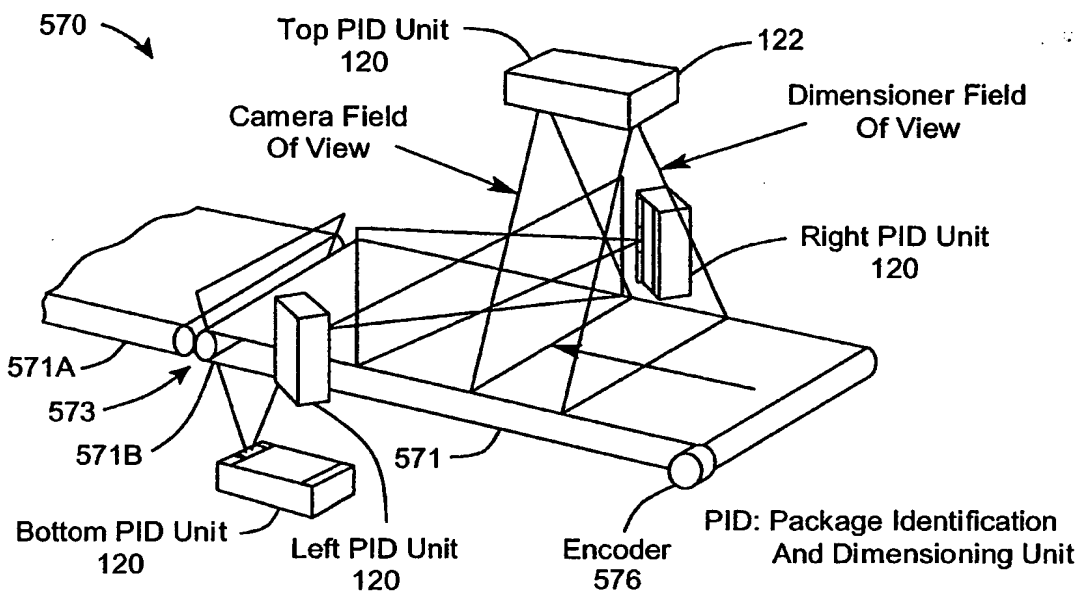


FIG. 27

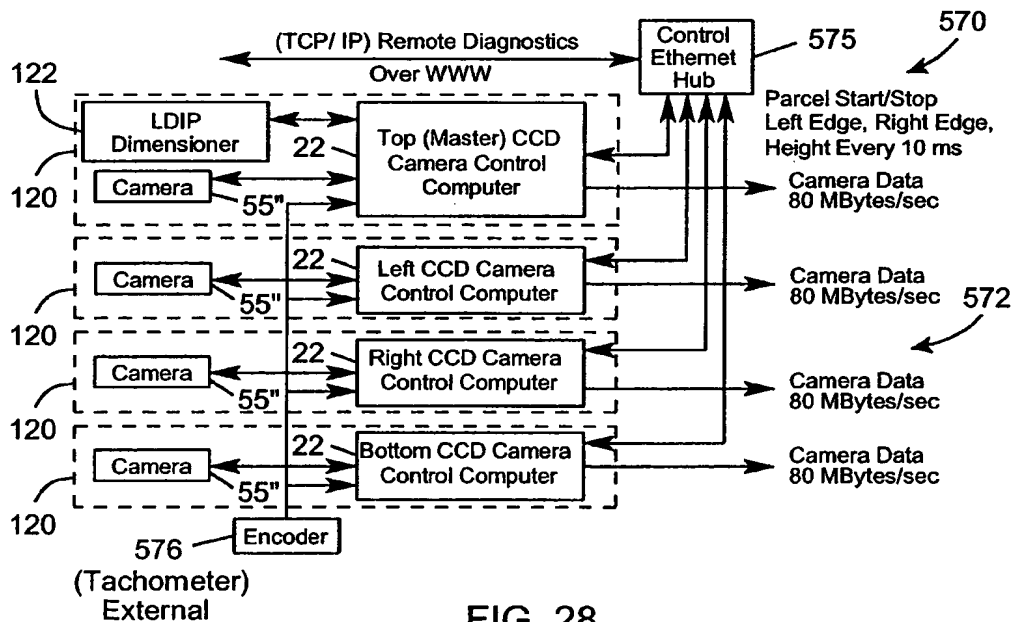


FIG. 28

2002073001

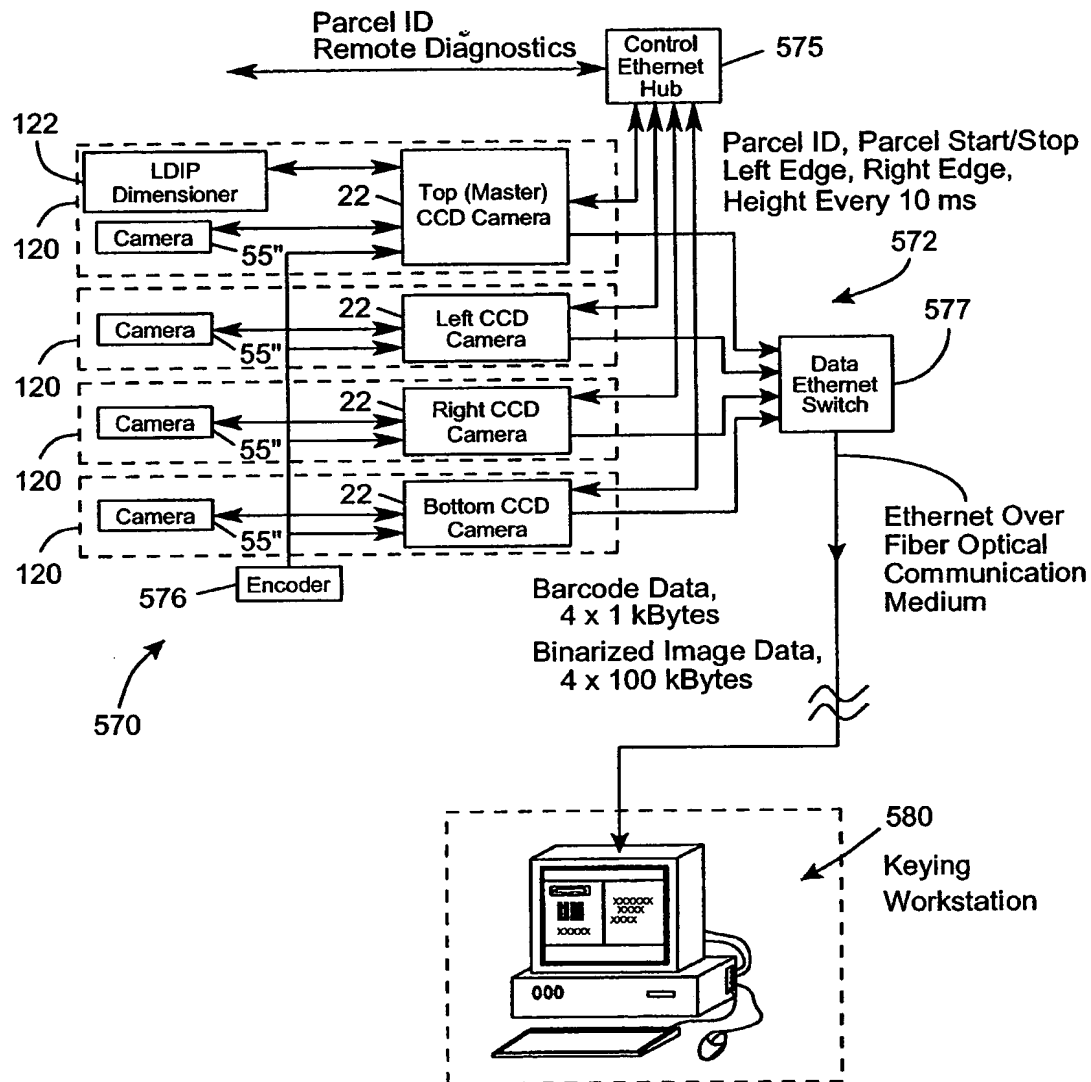


FIG. 29

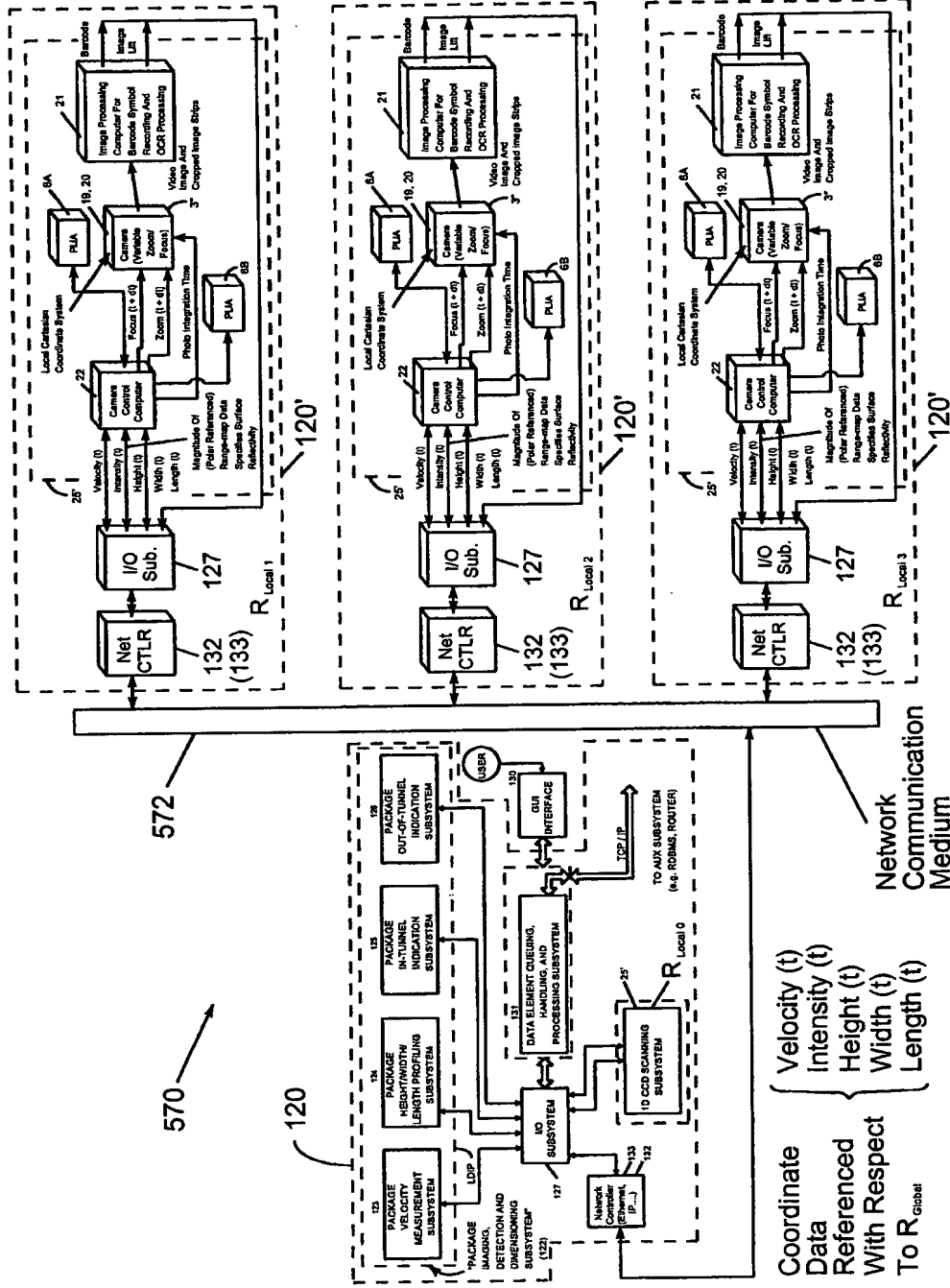


FIG. 30

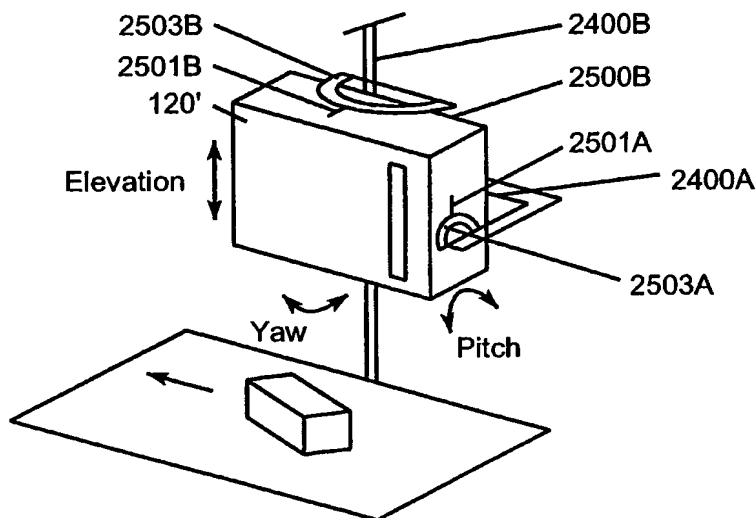


FIG. 31A

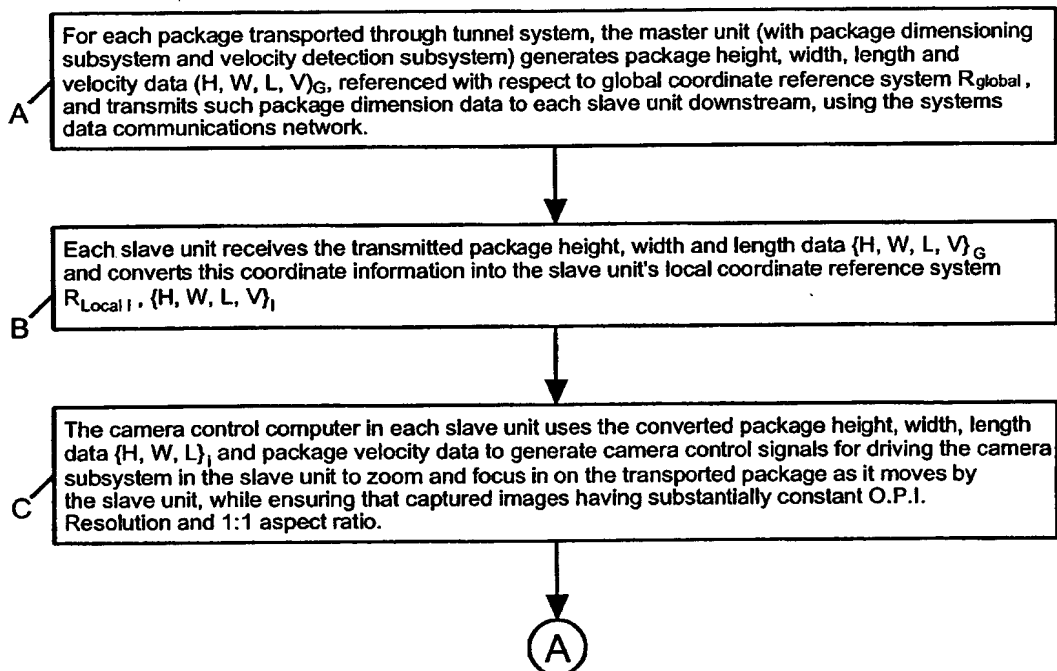


FIG. 32A

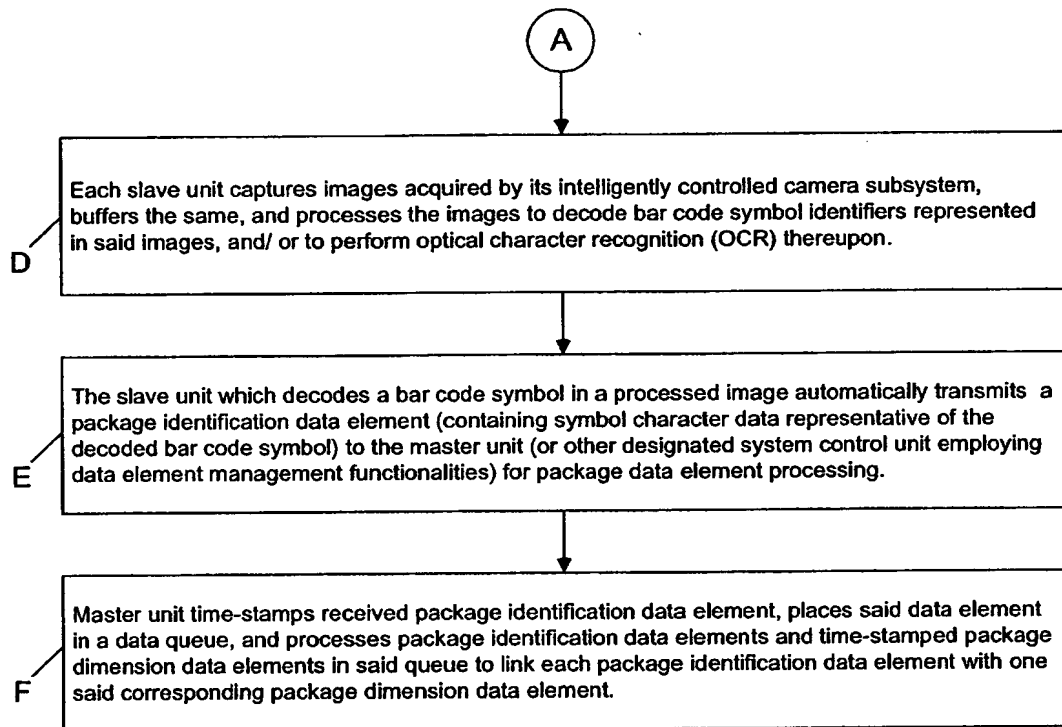


FIG. 32B

20060207 04525001

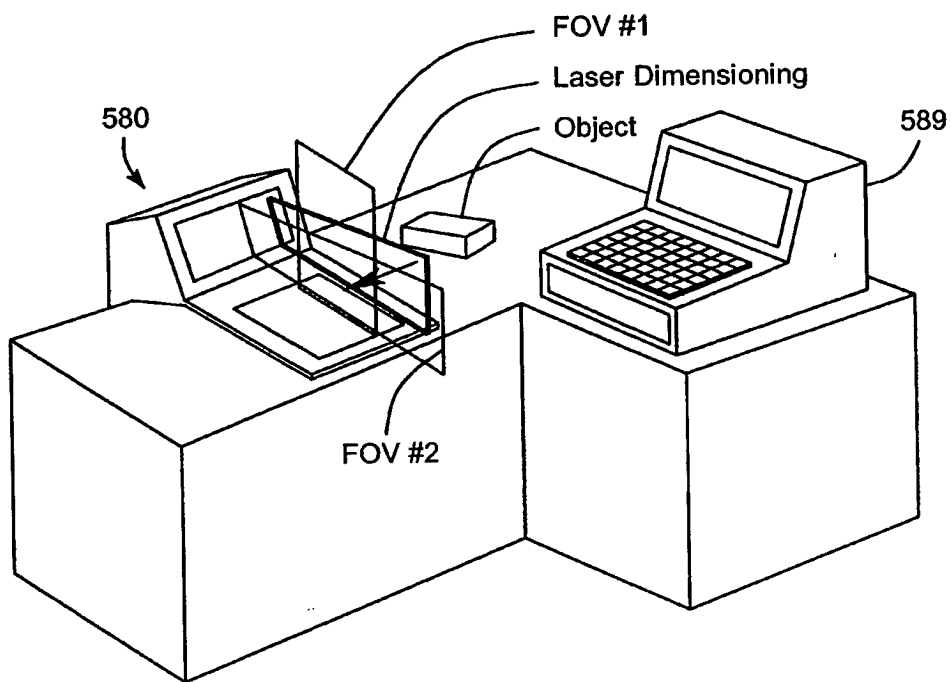


FIG. 33A

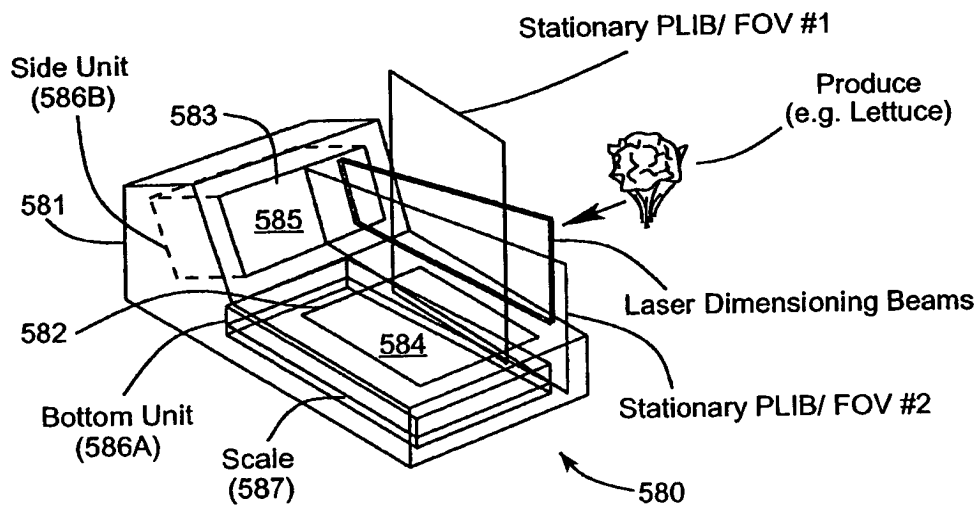


FIG. 33B

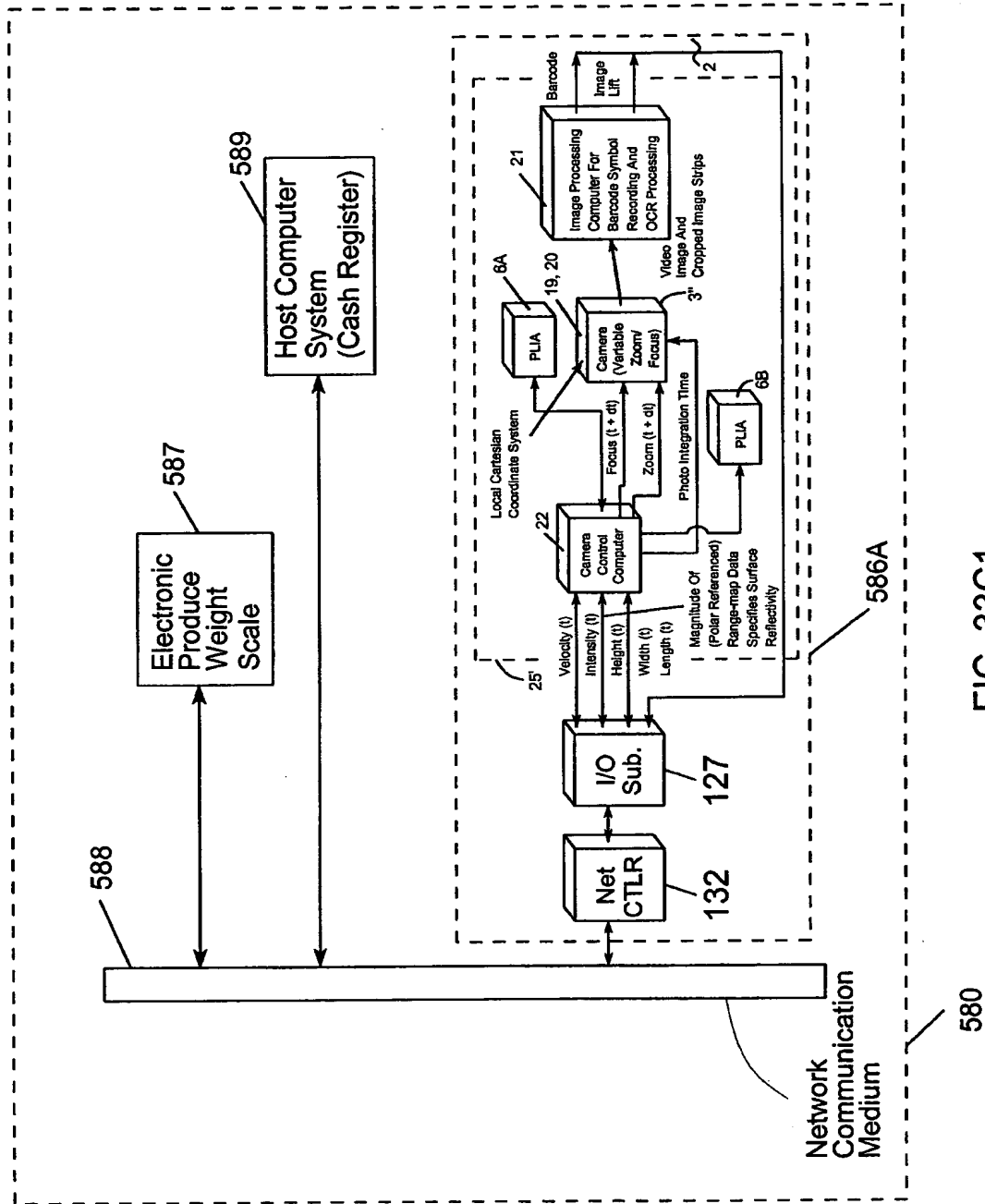


FIG. 33C1

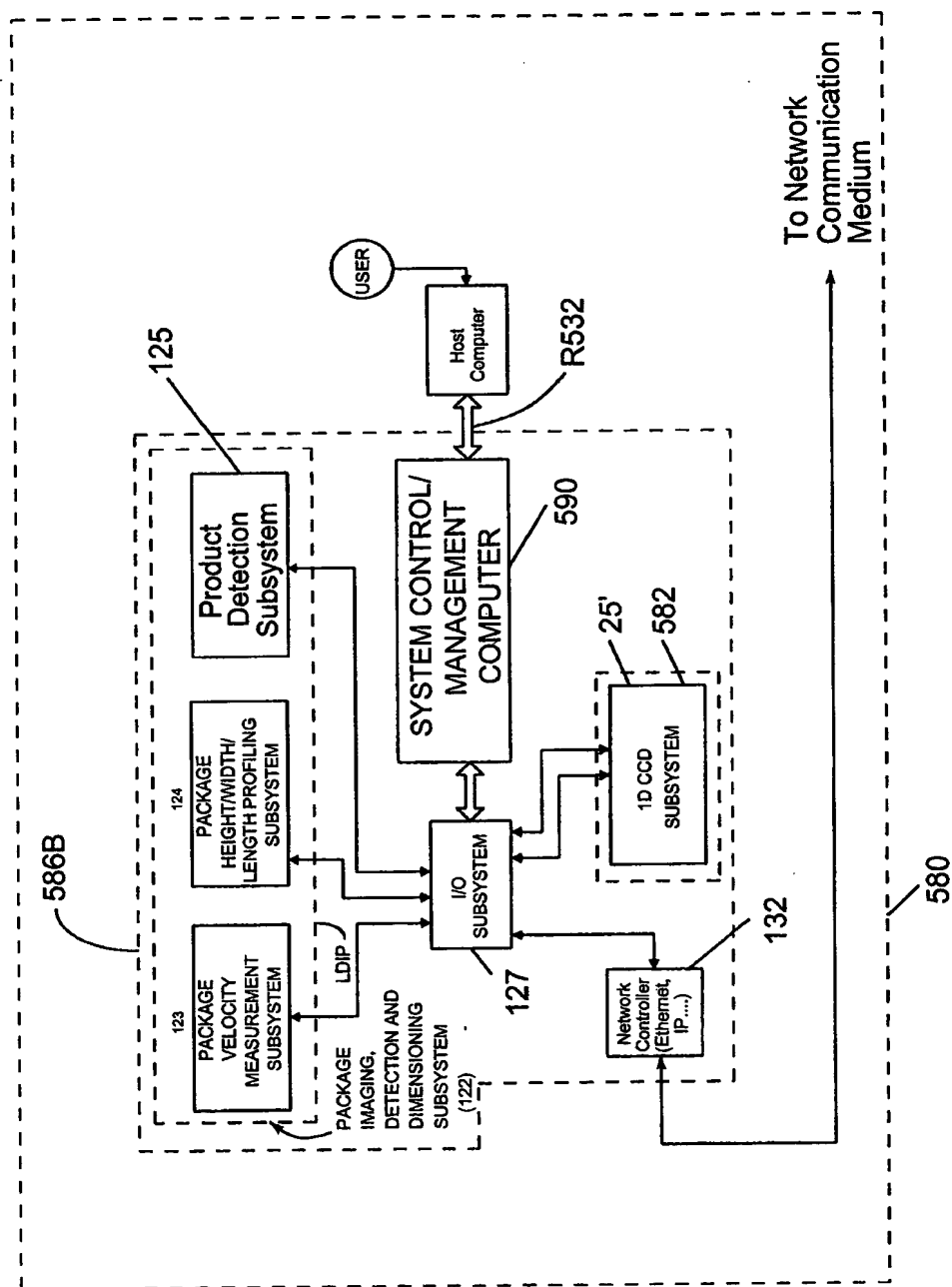


FIG. 33C2

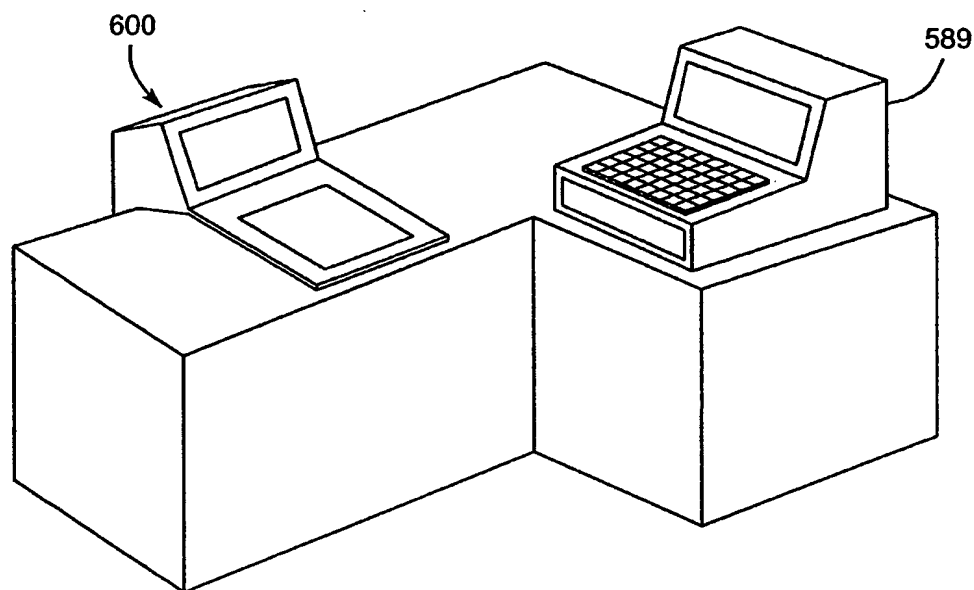


FIG. 34A

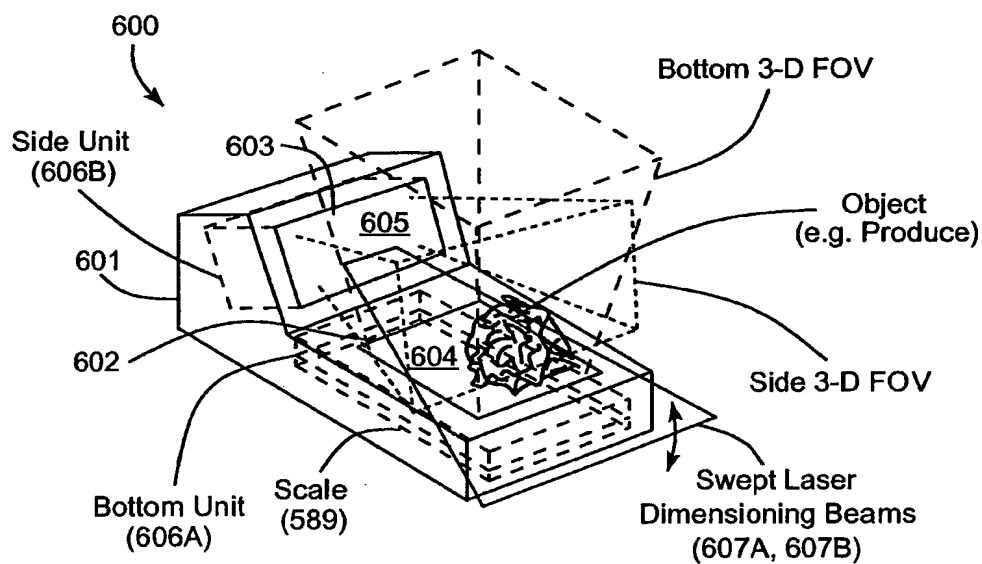


FIG. 34B

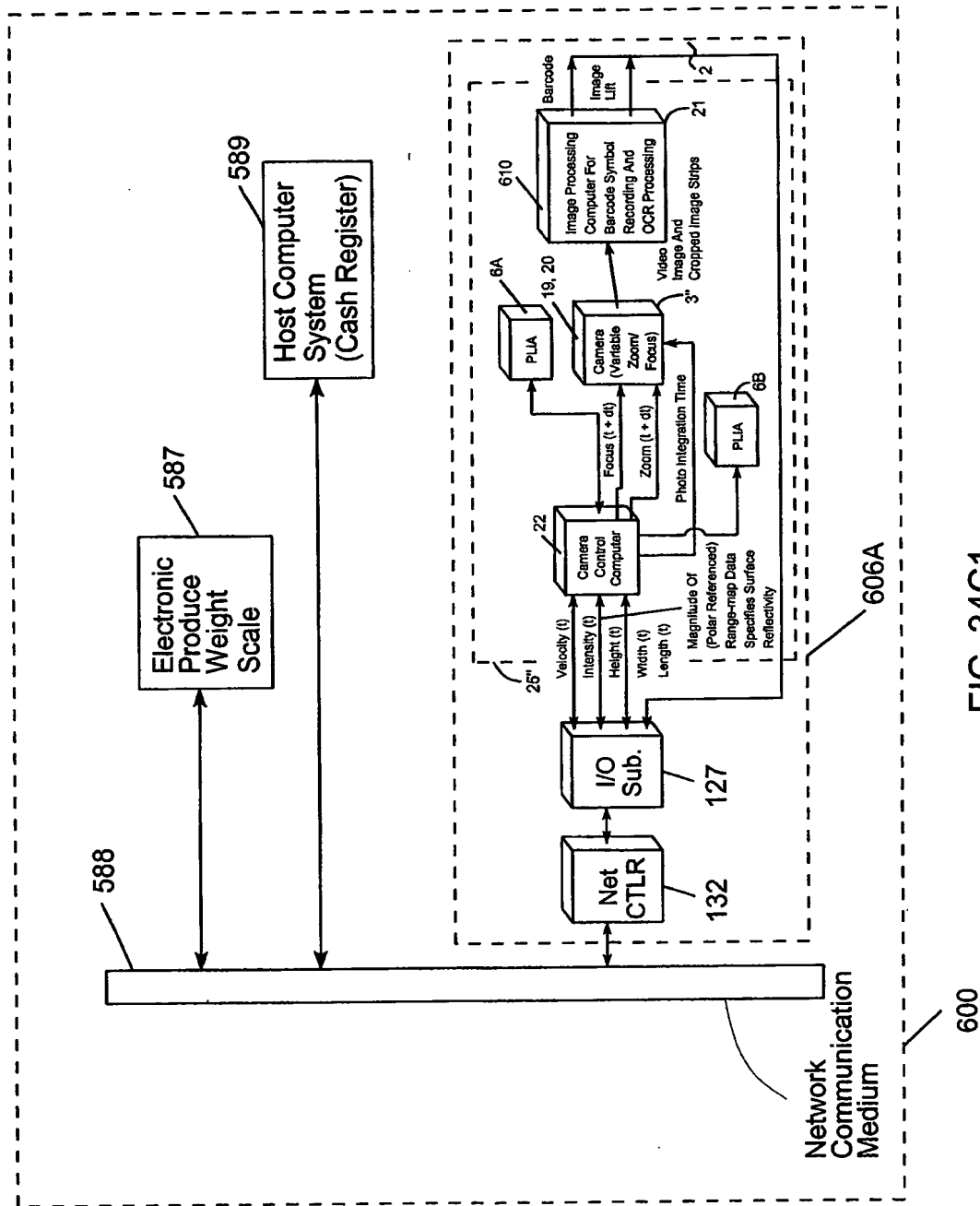


FIG. 34C1

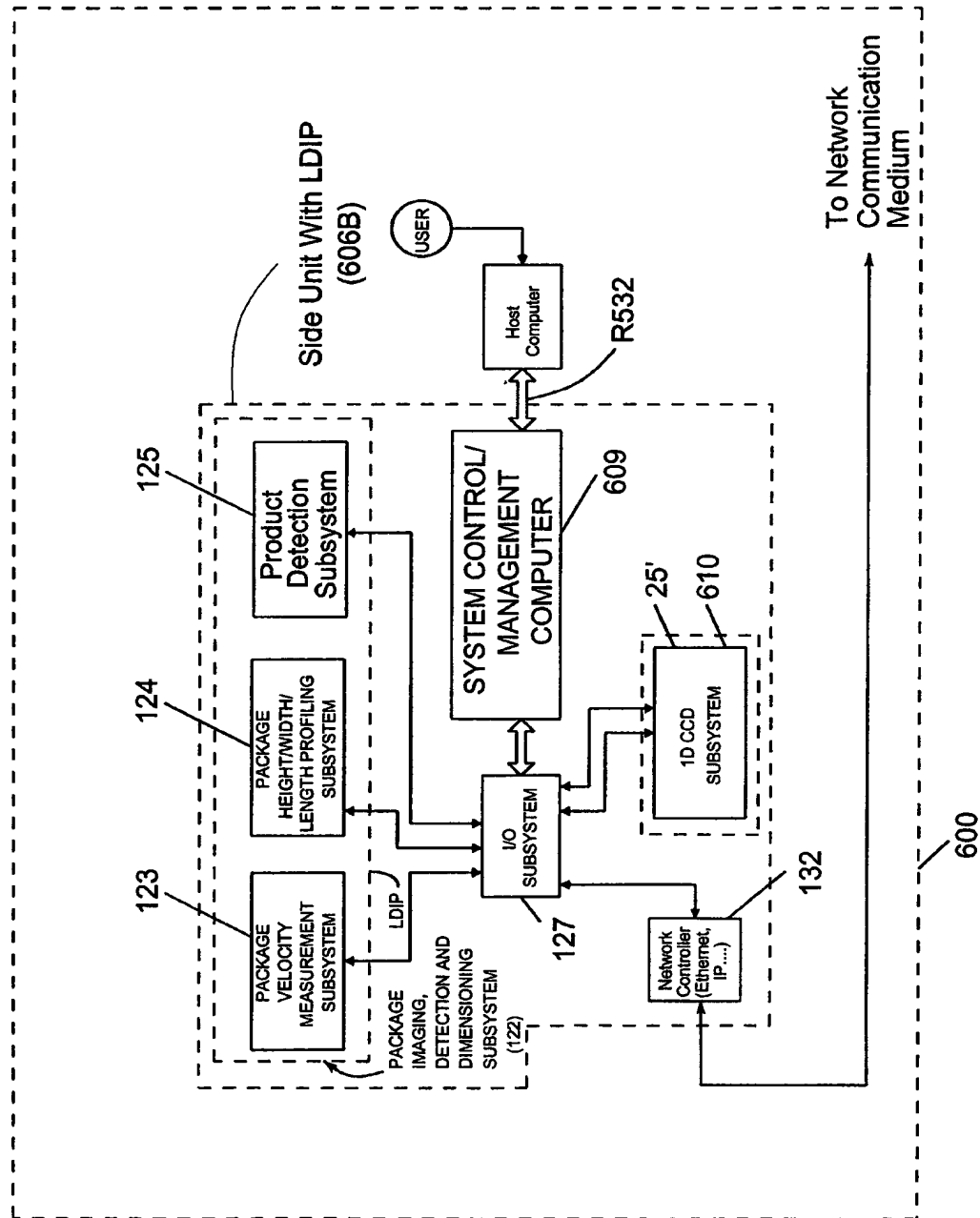


FIG. 34C2

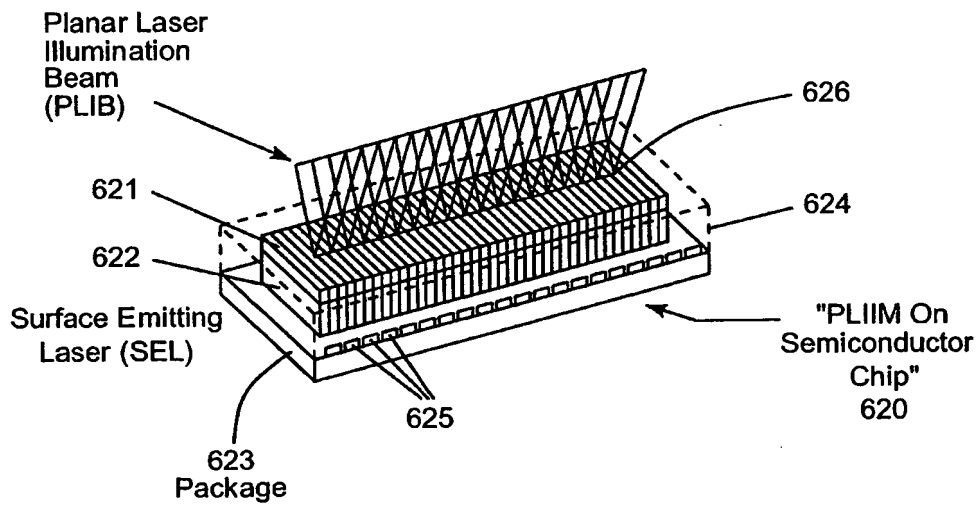


FIG. 35A

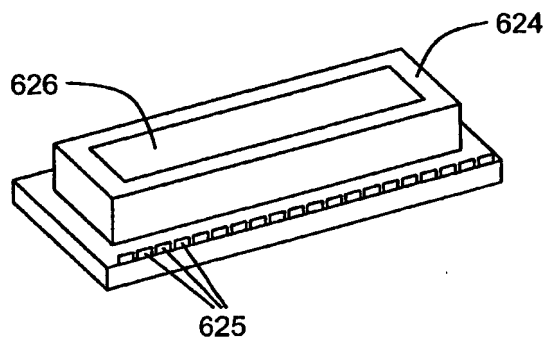


FIG. 35B

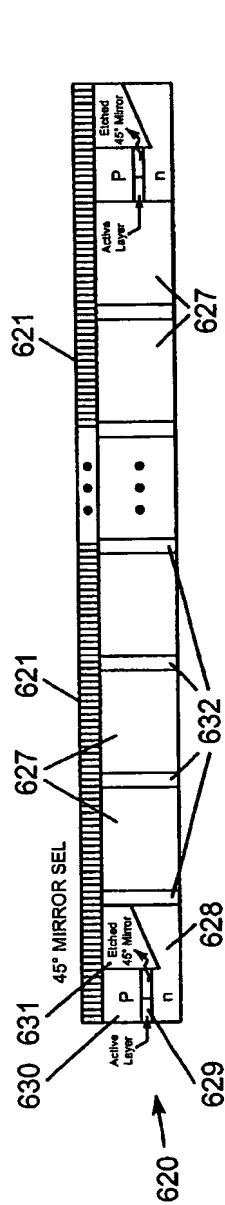


FIG. 36A

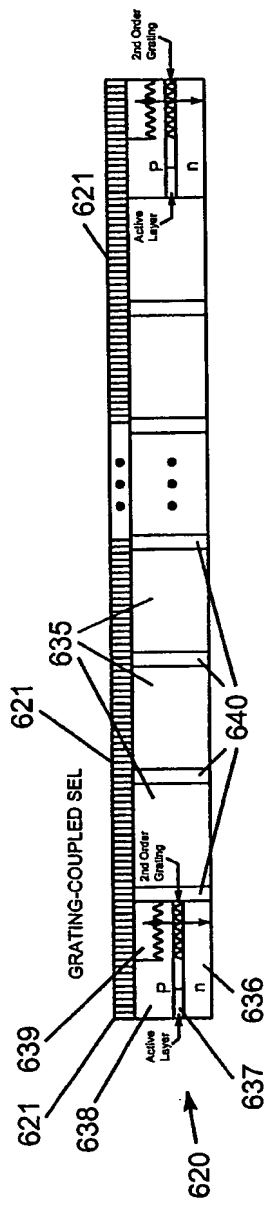


FIG. 36B

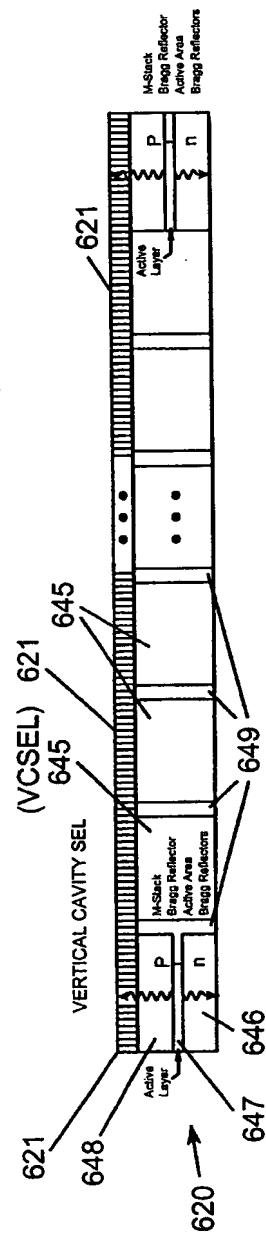


FIG. 36C

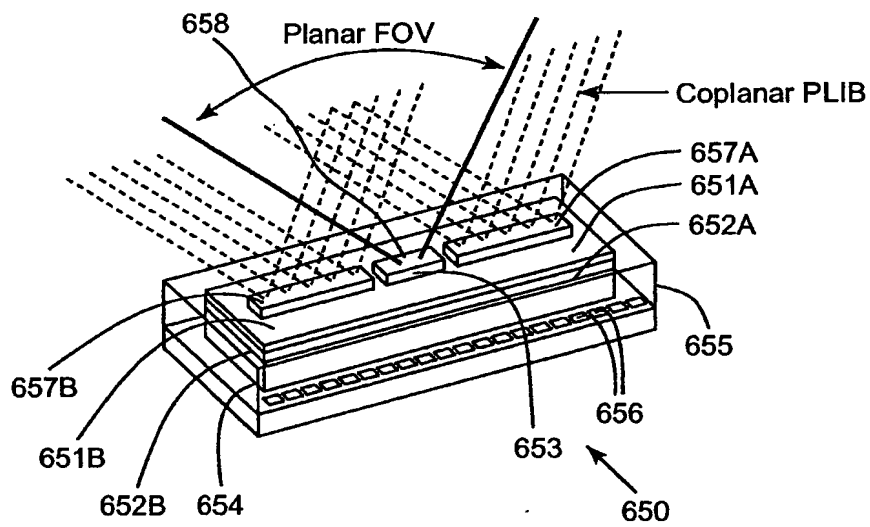


FIG. 37

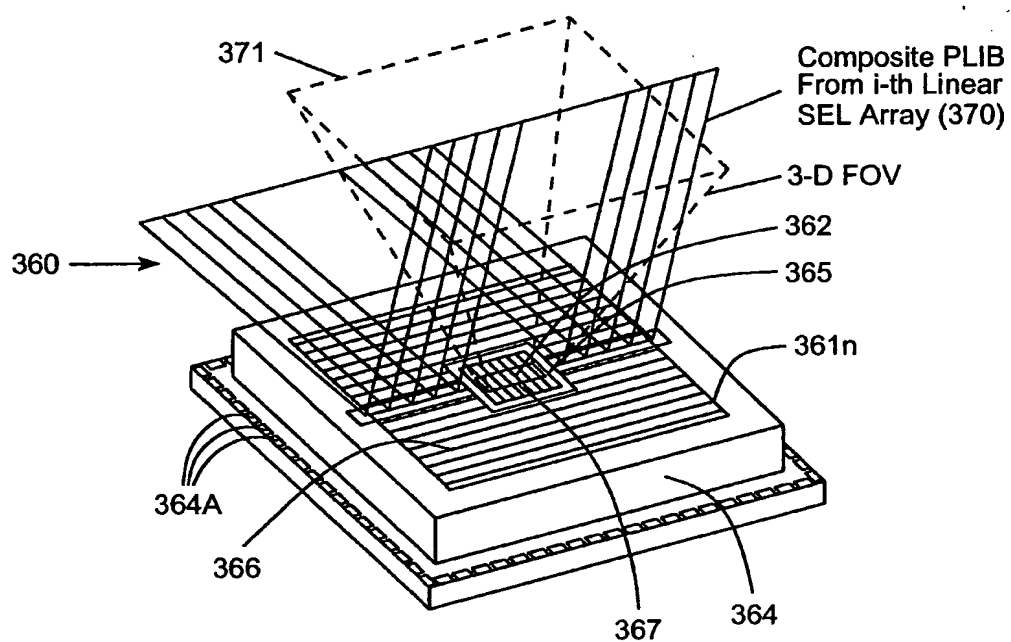


FIG. 38A

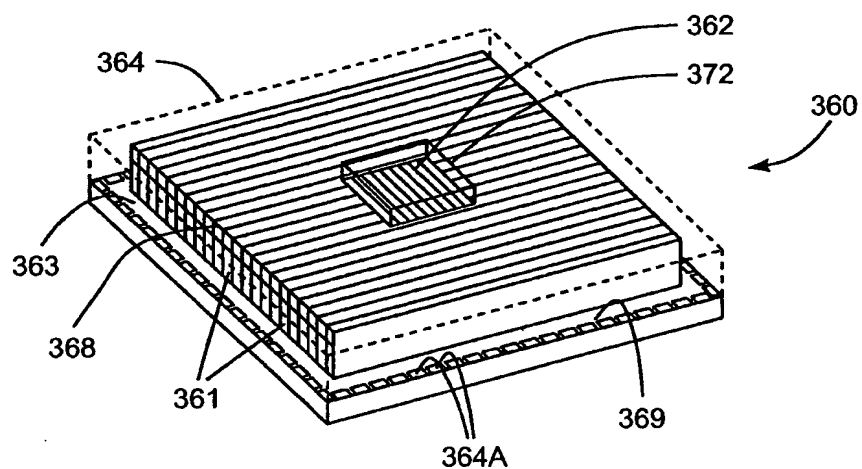


FIG. 38B

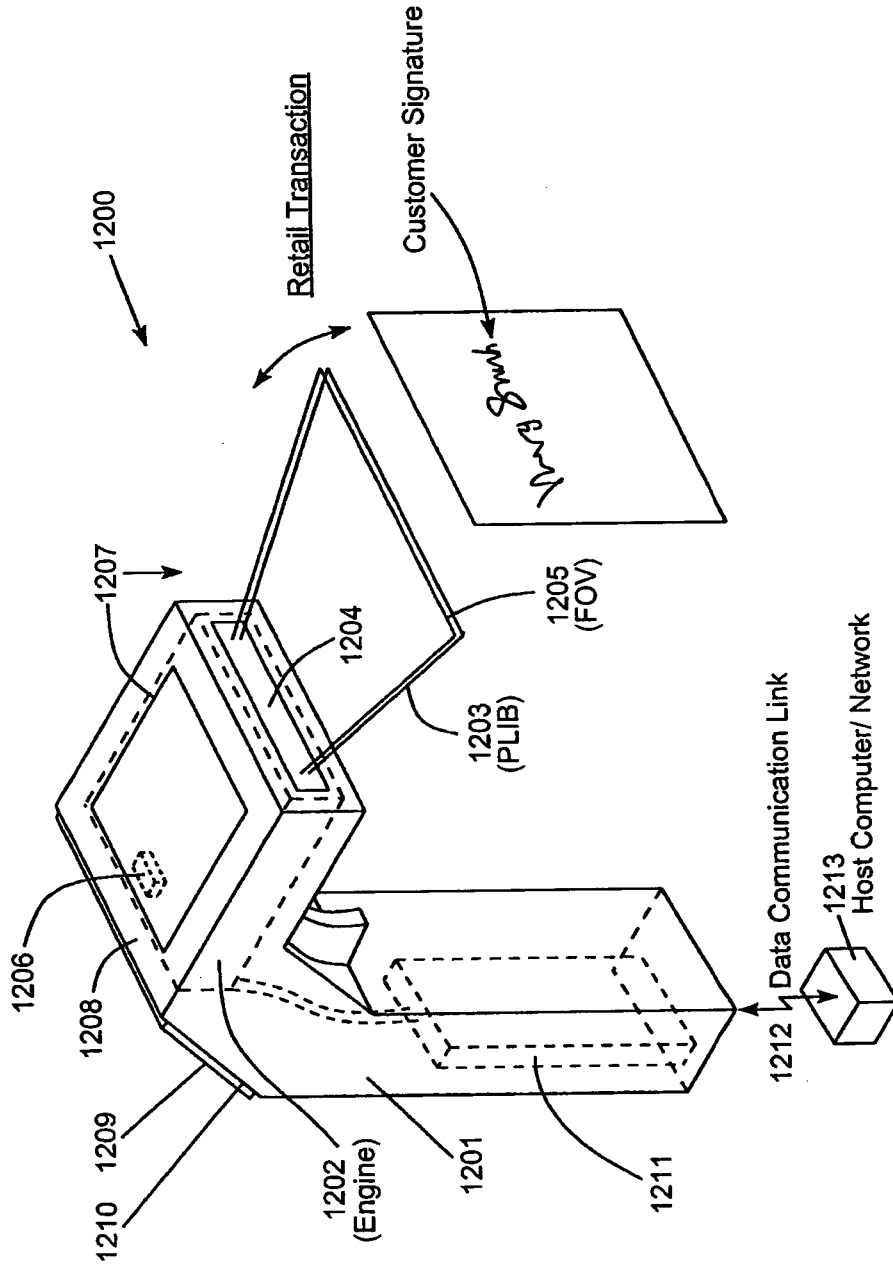


FIG. 39A

2002071523001

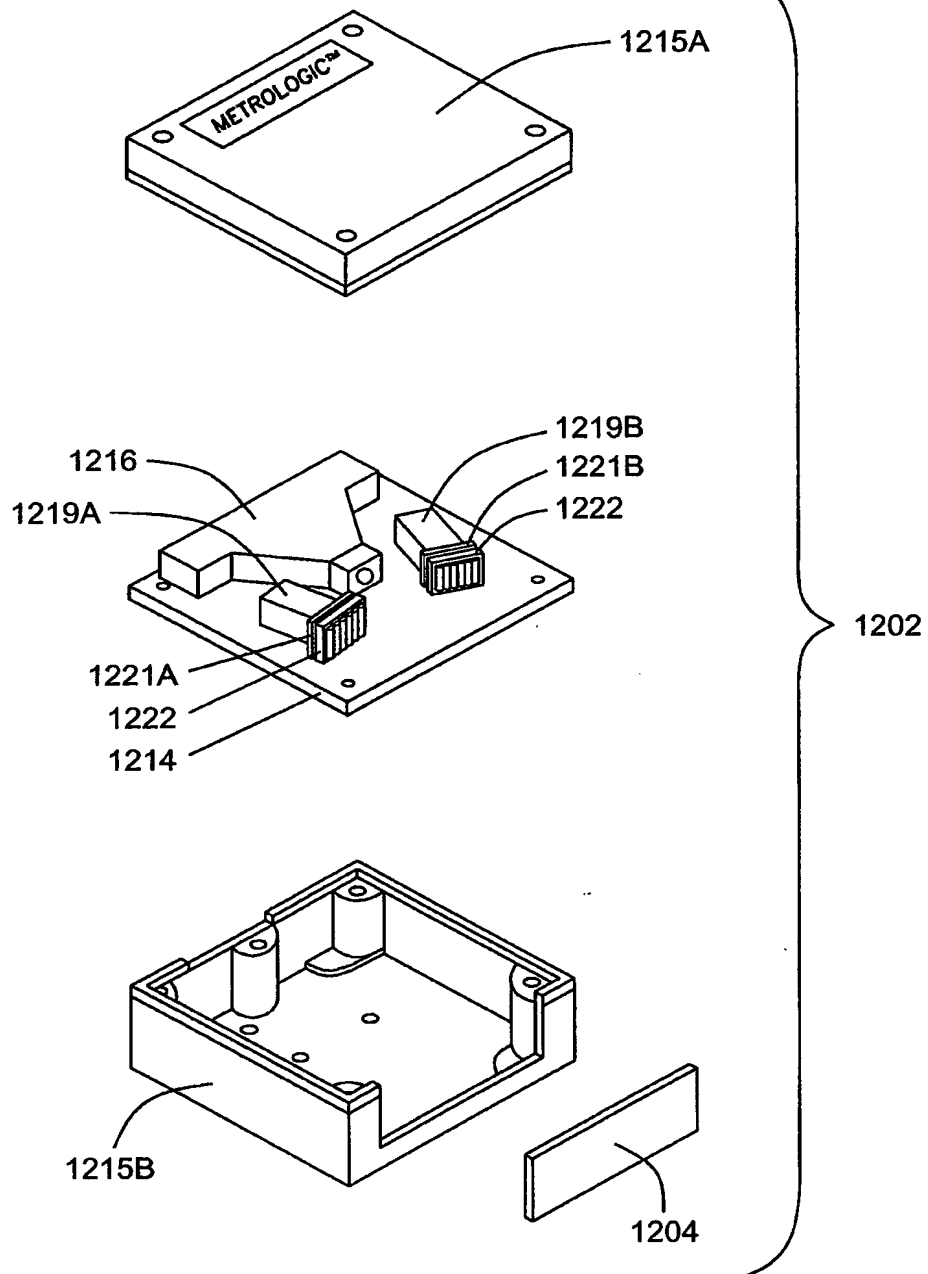


FIG. 39B

2007-02-01 09:52:30

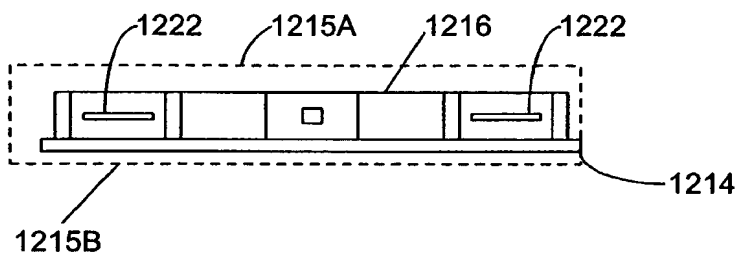


FIG. 39D

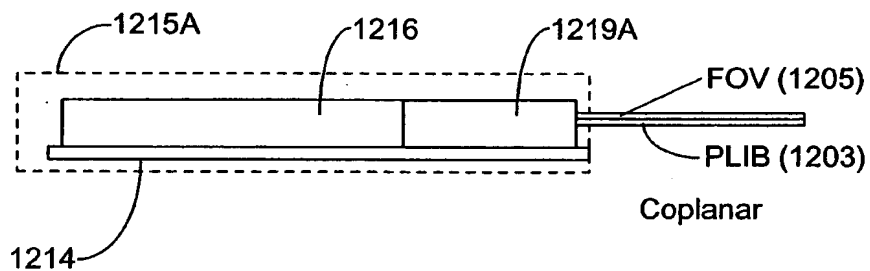


FIG. 39E

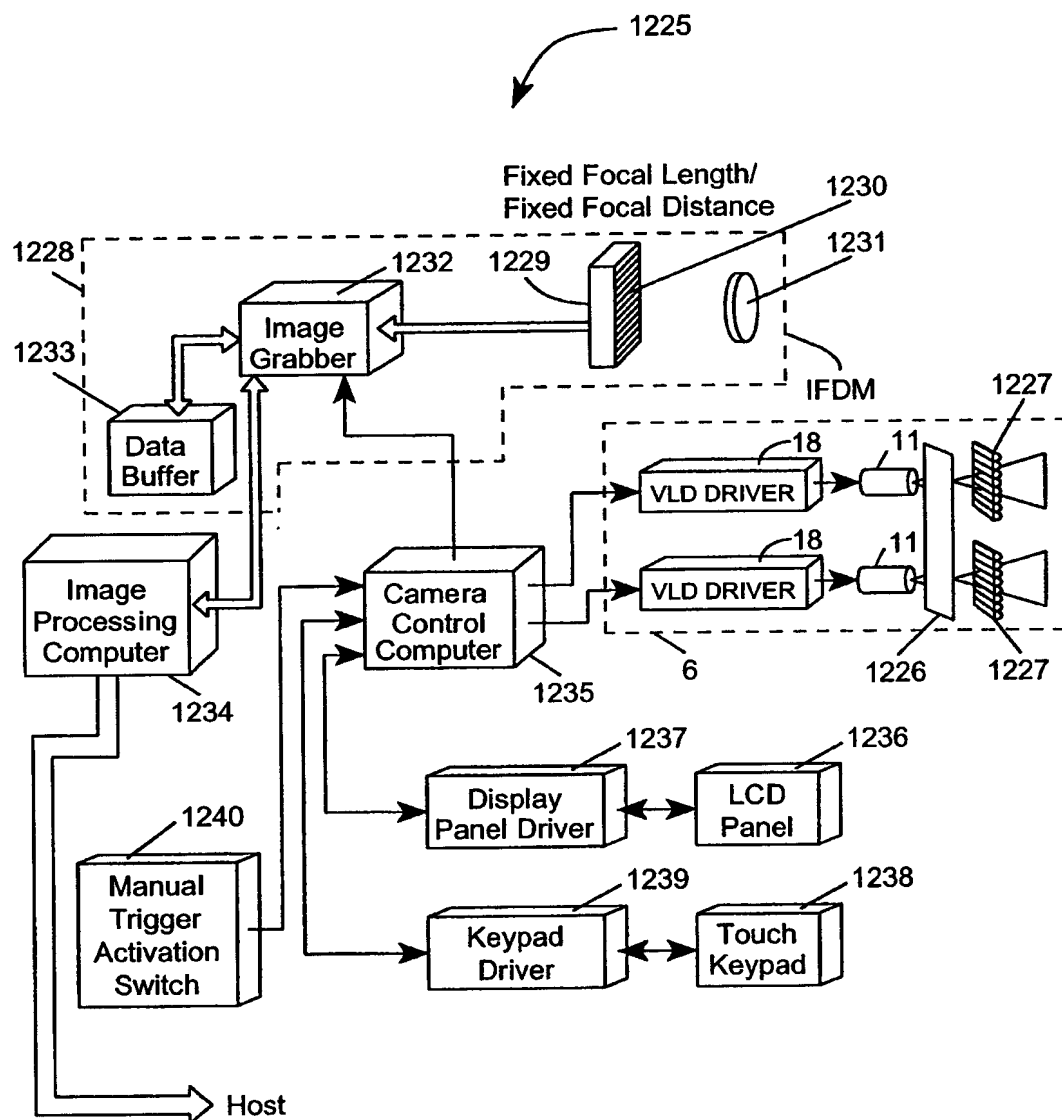
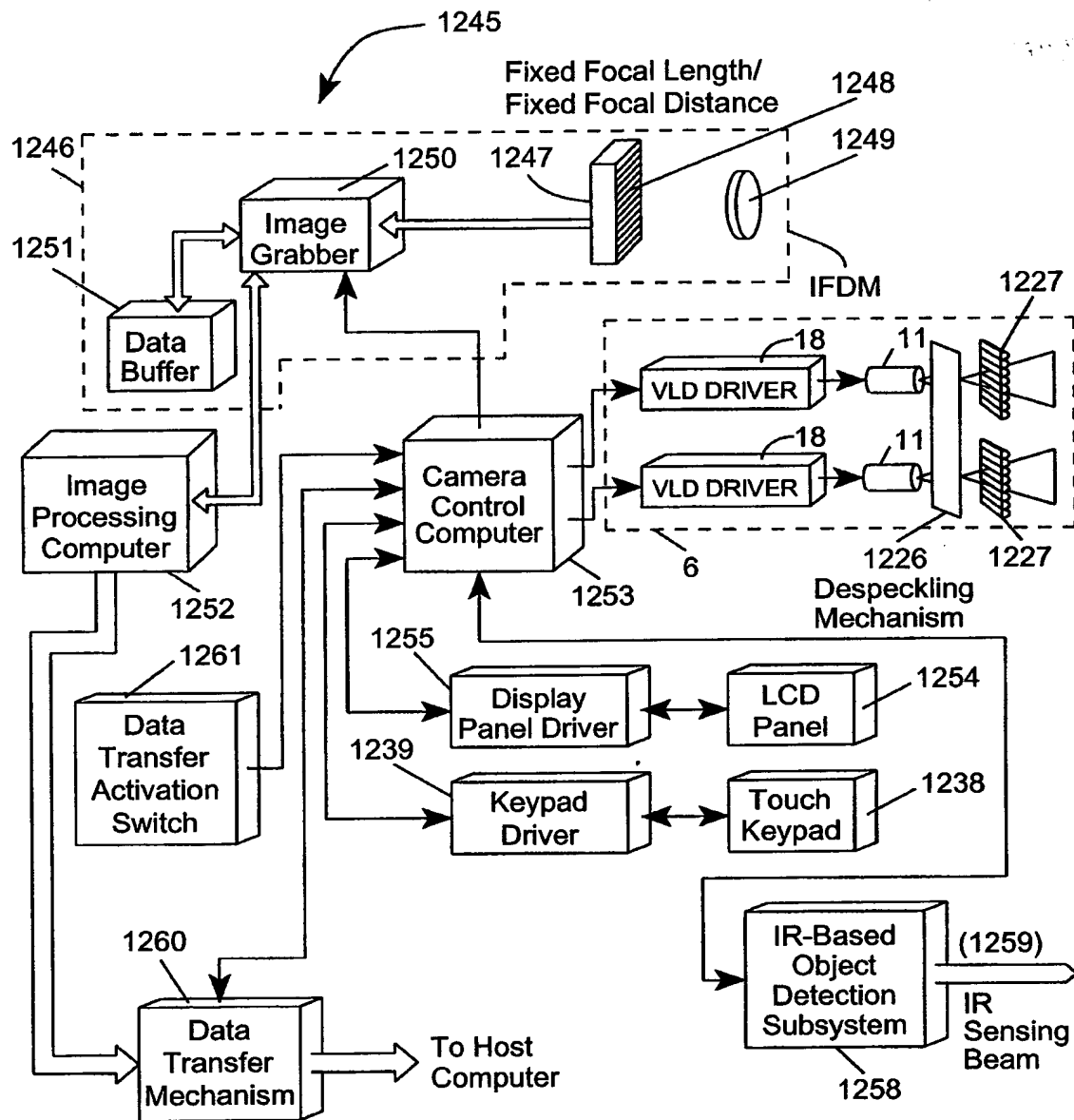


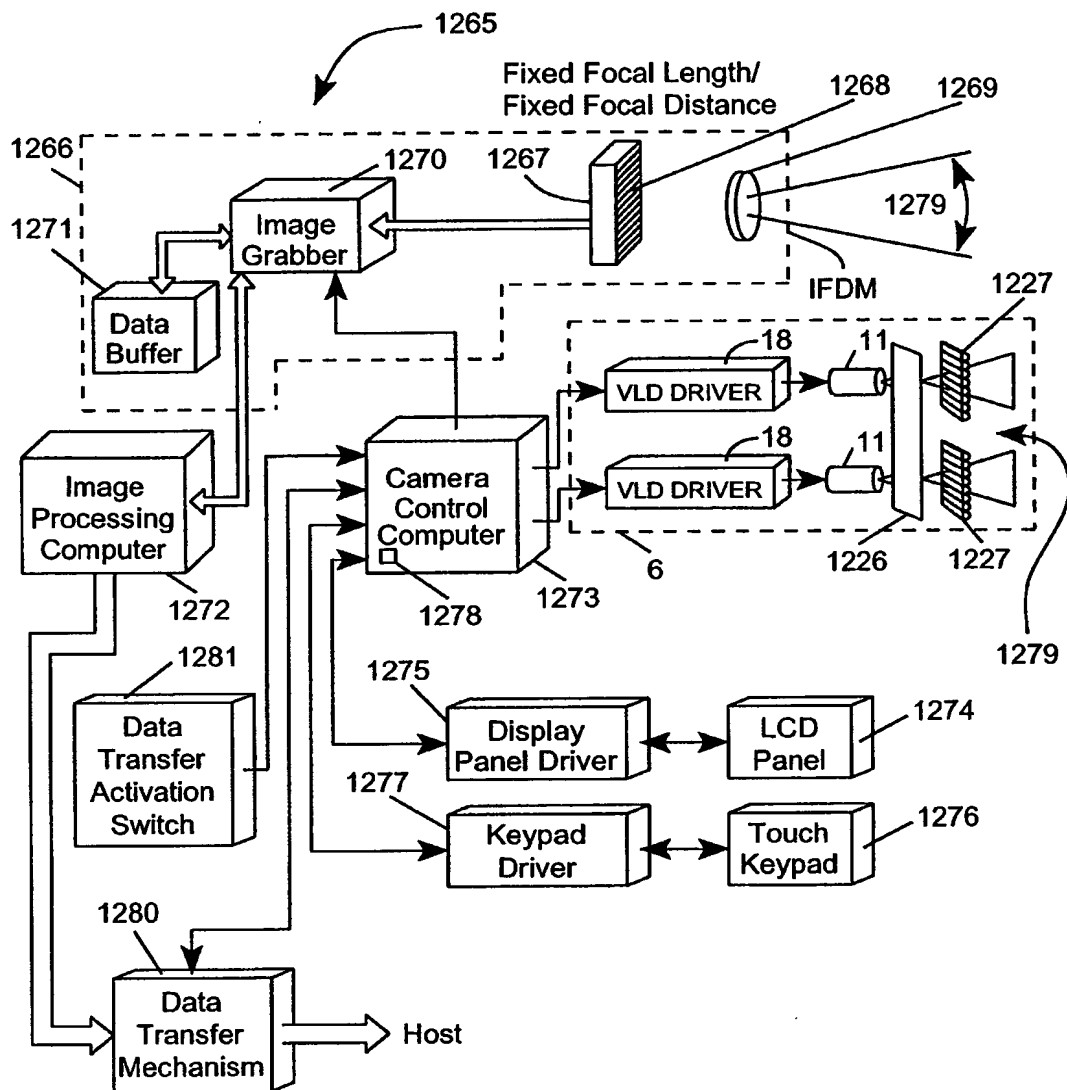
FIG. 40A1

2025 RELEASE UNDER E.O. 14176



Automatic with IR Object Detection

FIG. 40A2



Automatic with Laser Based Object Detection

FIG. 40A3

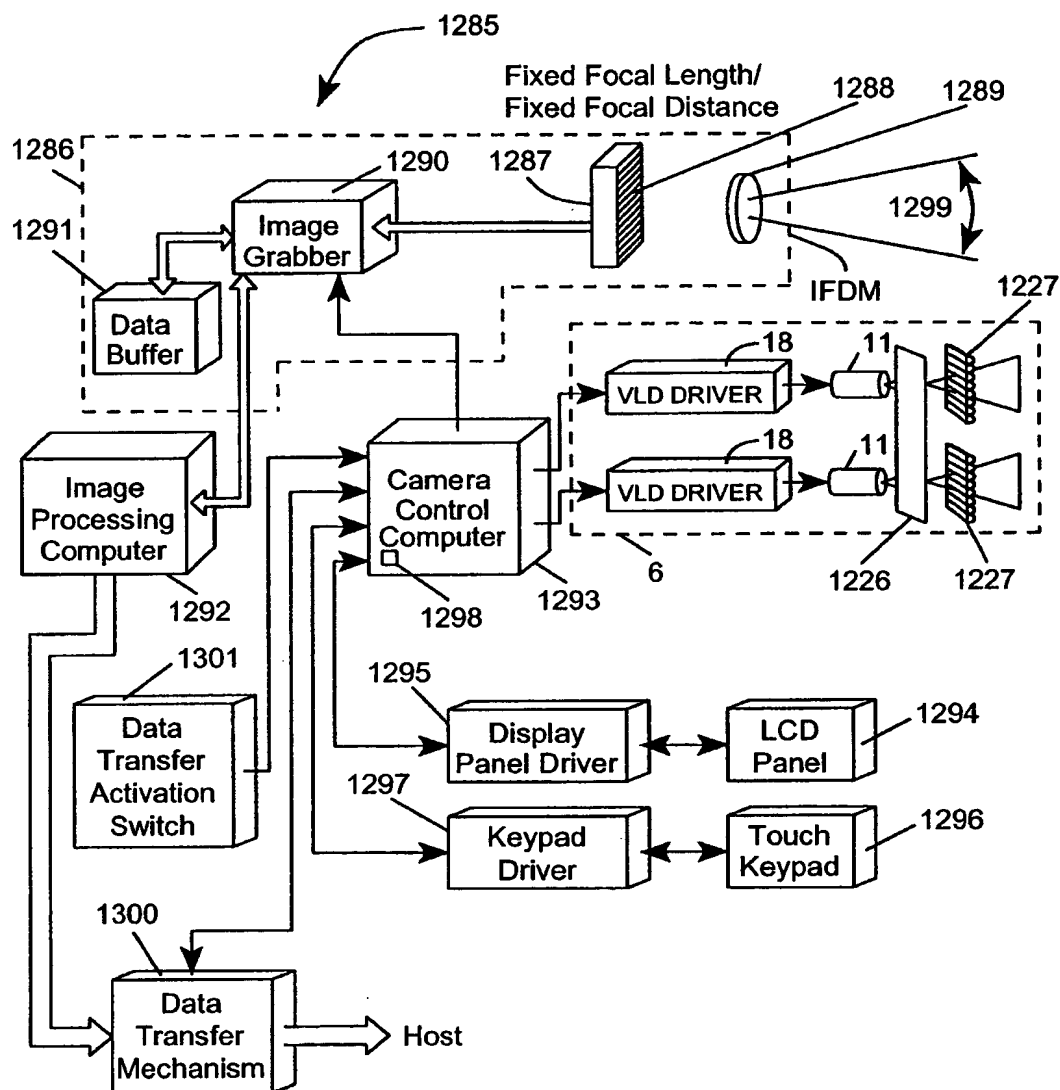


FIG. 40A4

200007045001

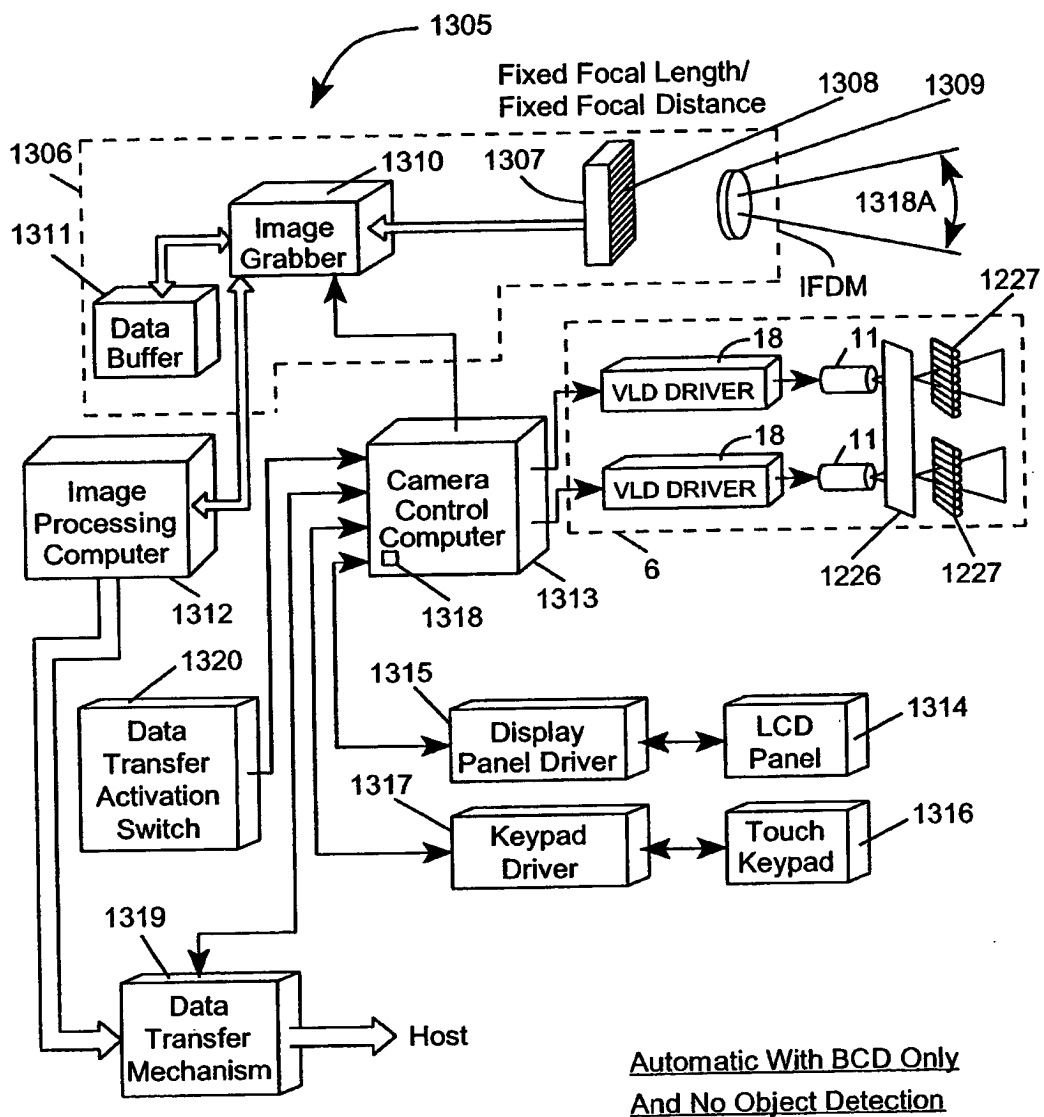


FIG. 40A5

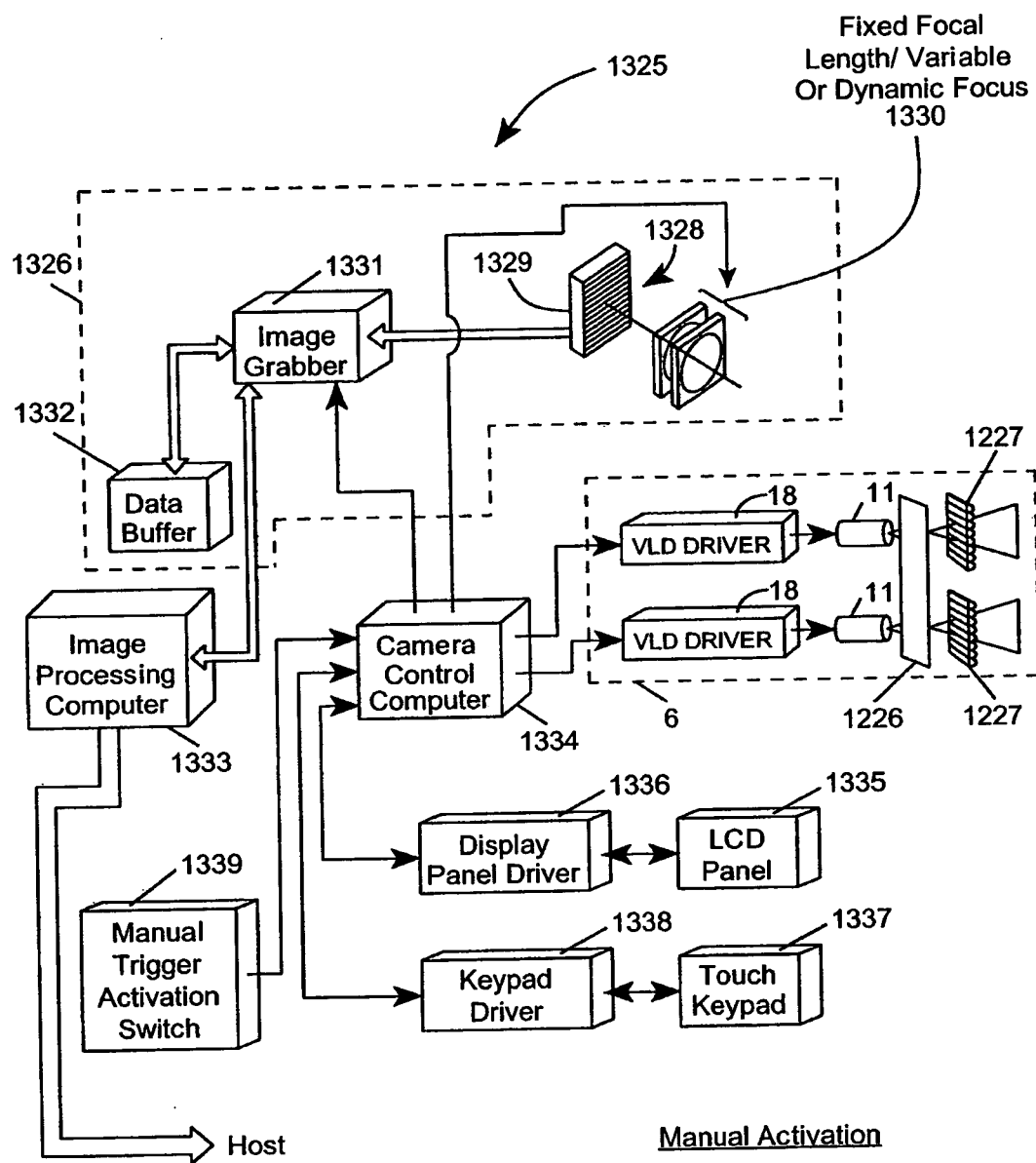
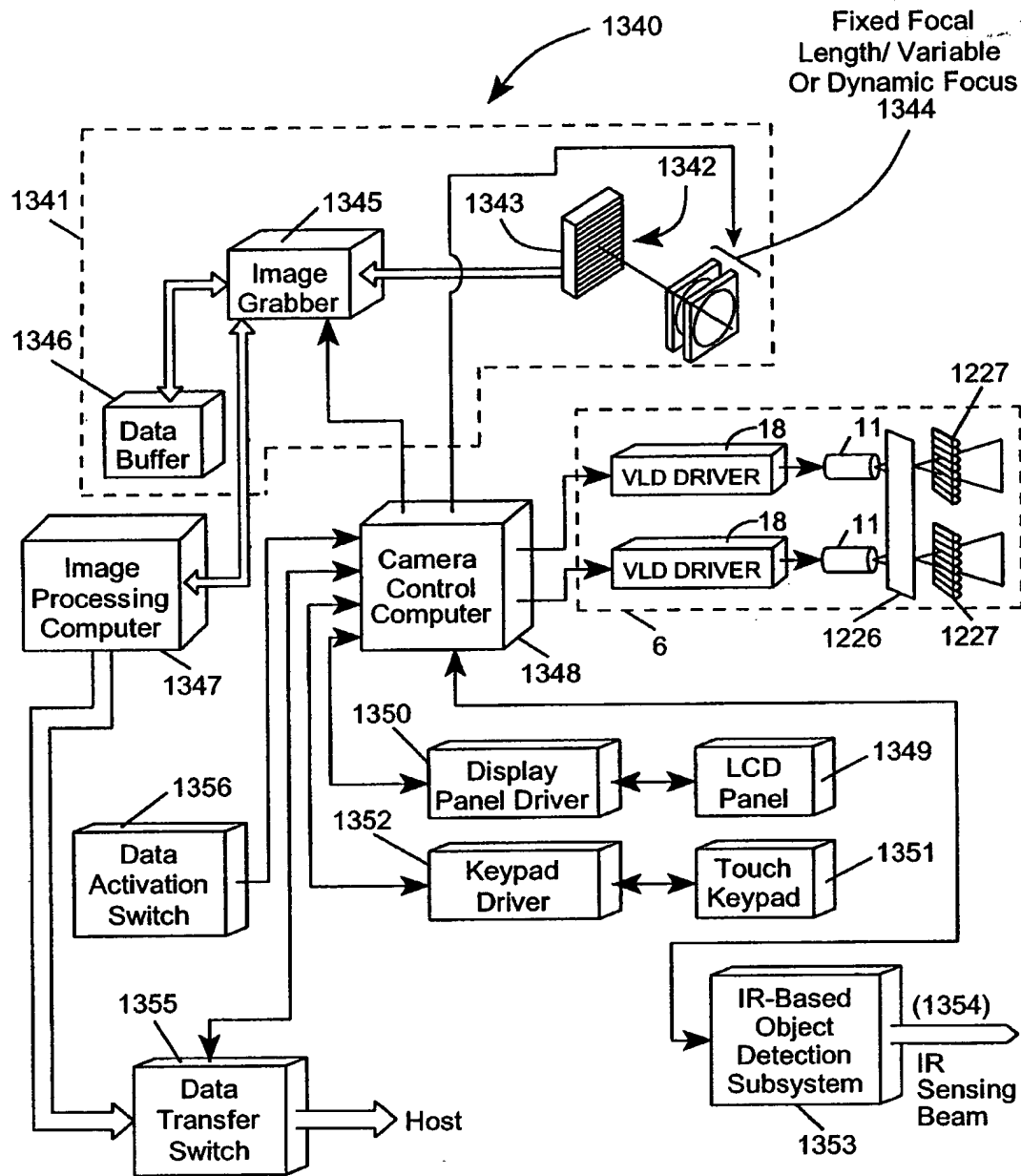


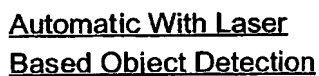
FIG. 40B1

FIG. 40B2



Automatic With IR-Based
Object Detection

FIG. 40B2



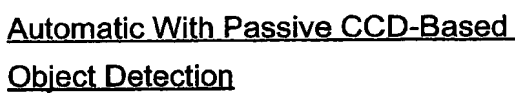


FIG. 40B4

200001523001

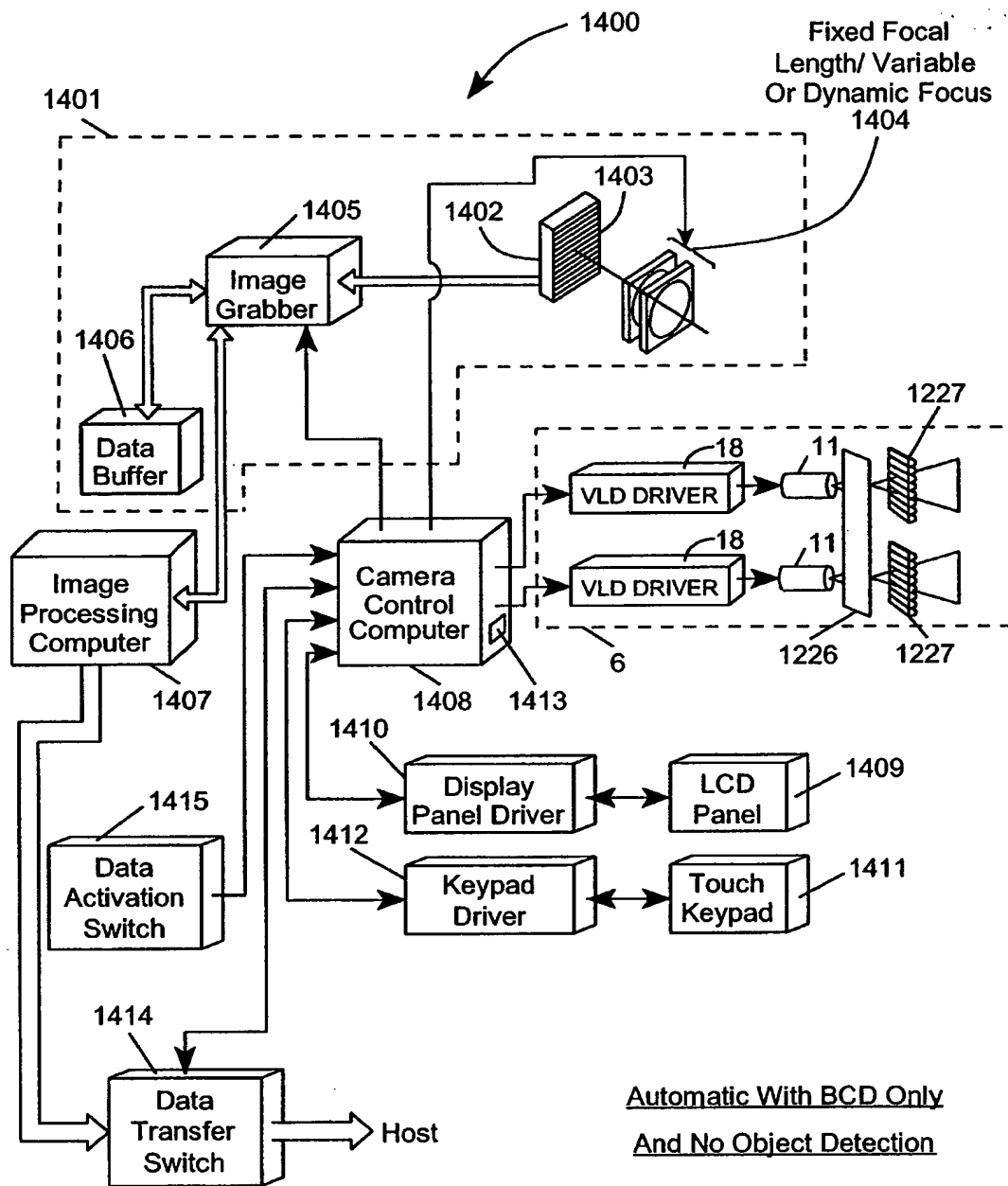
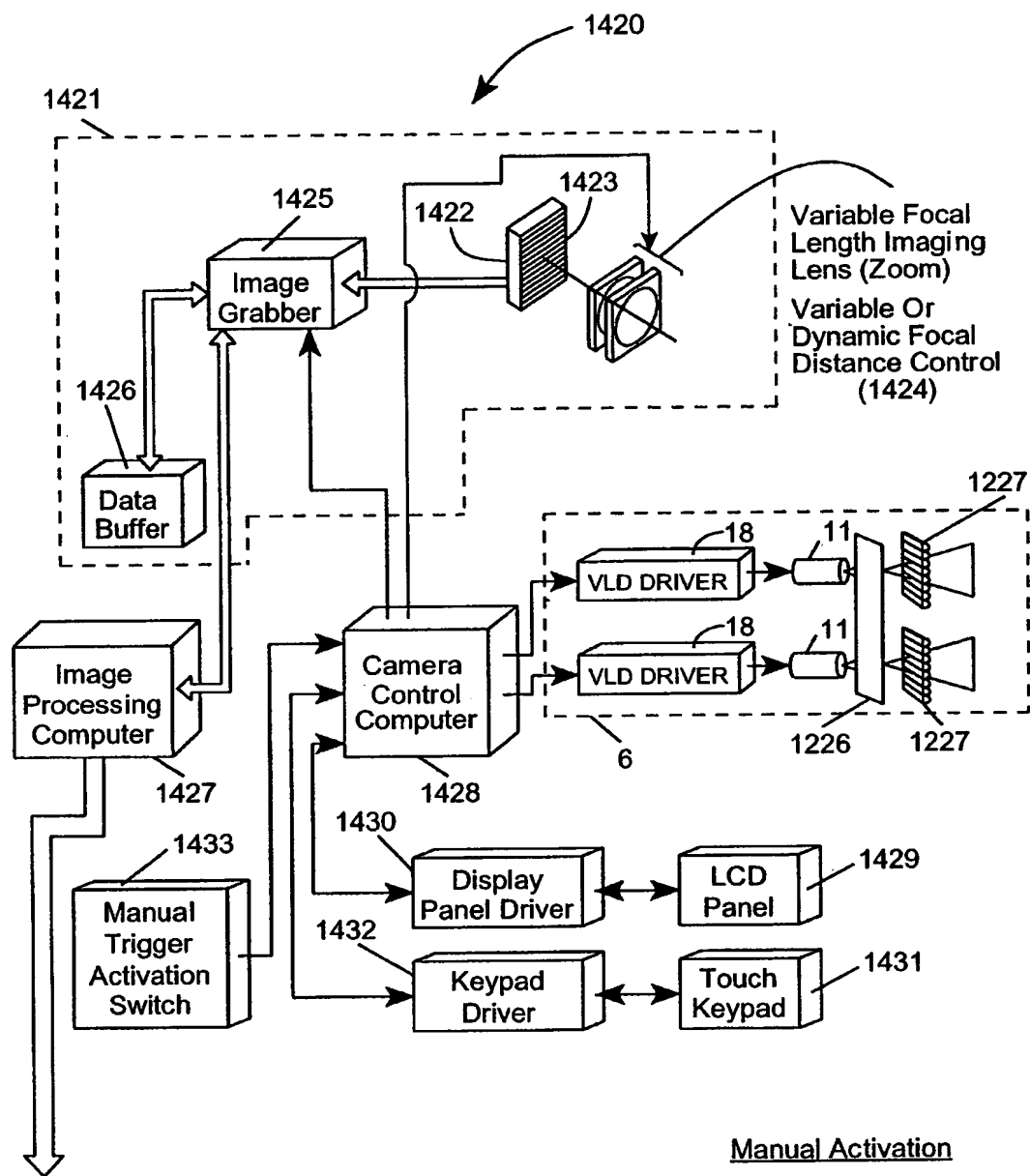


FIG. 40B5



Manual Activation

FIG. 40C1

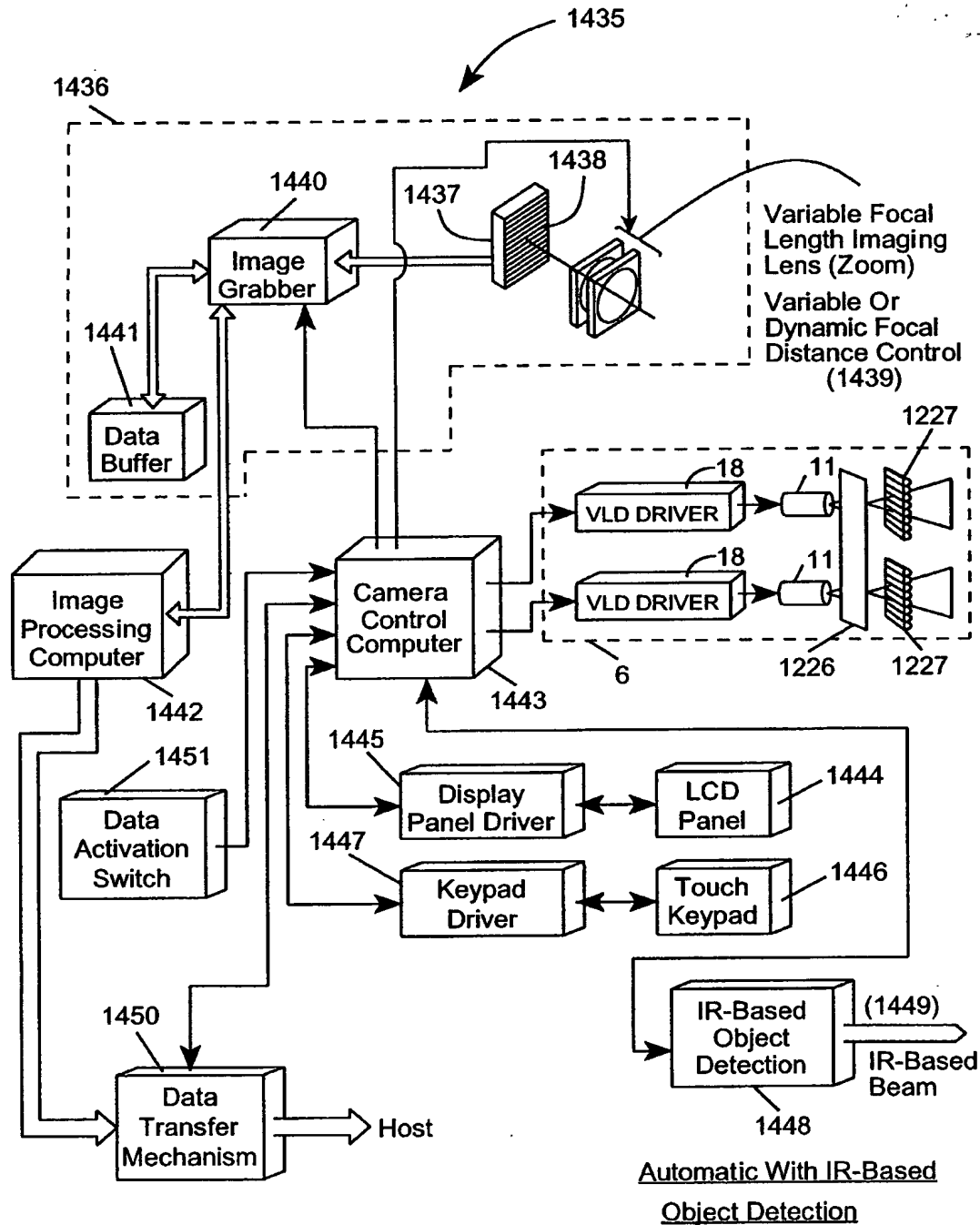


FIG. 40C2

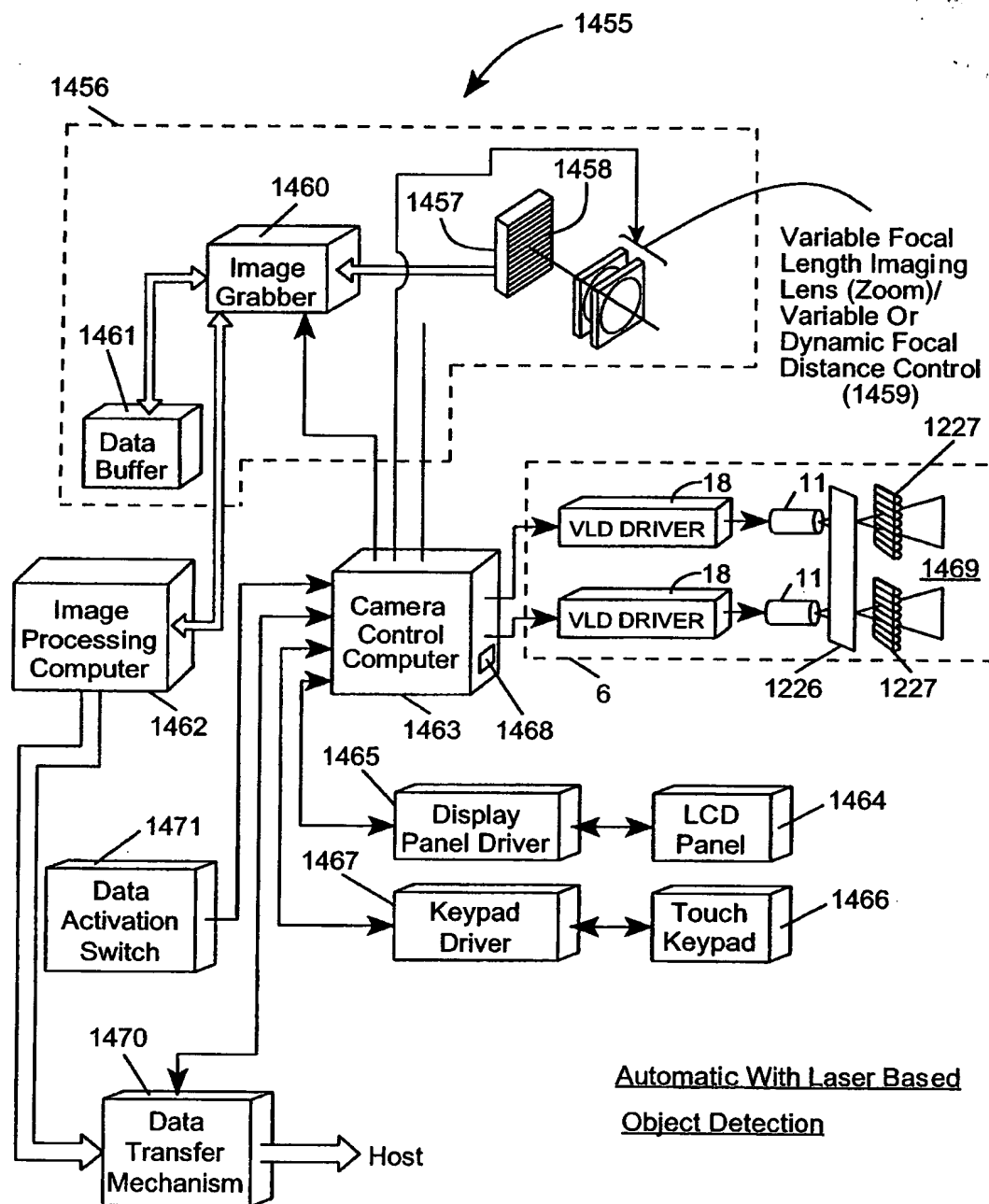


FIG. 40C3

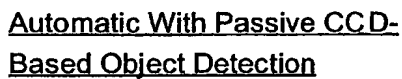


FIG. 40C4

20060207 04529001

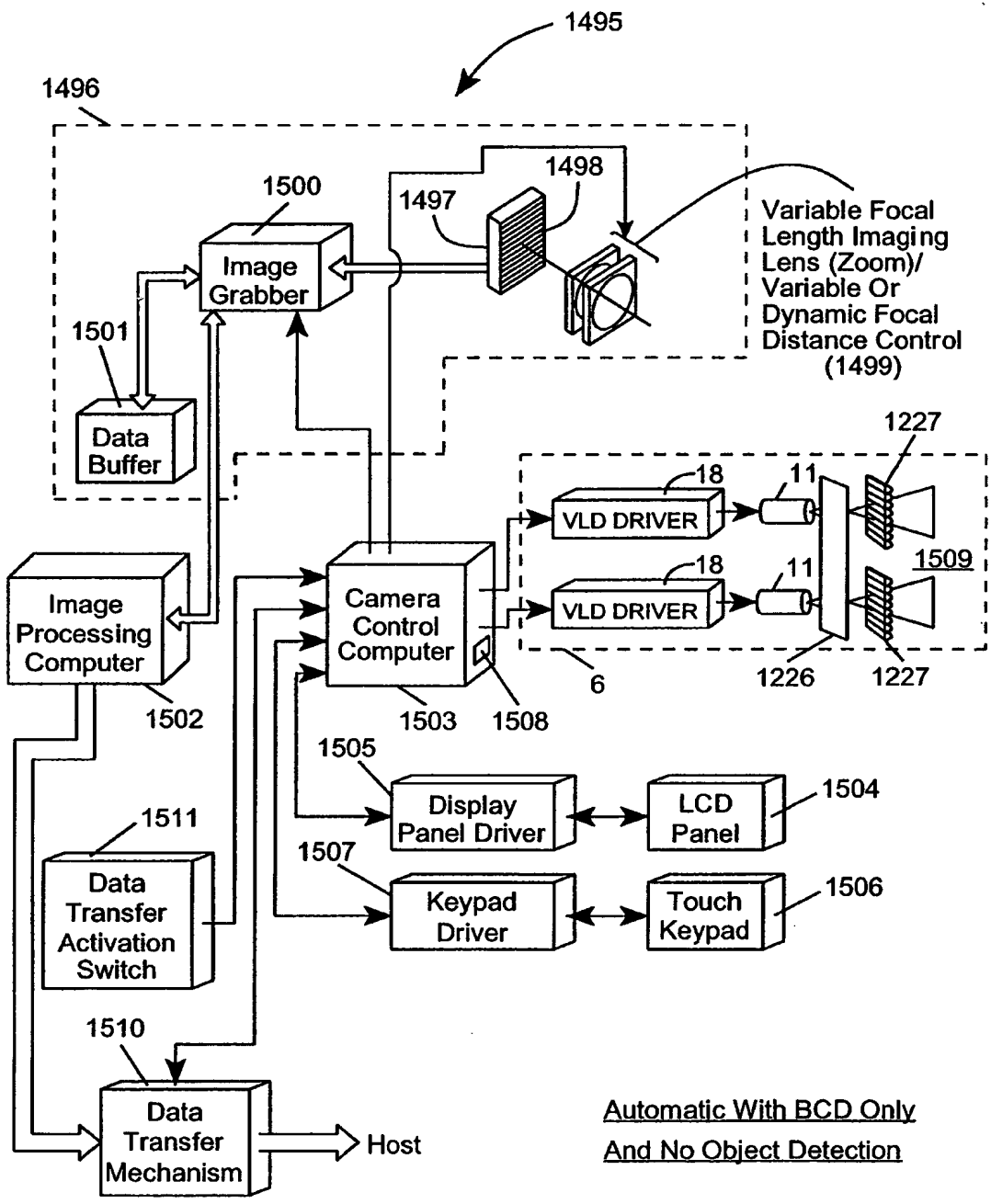
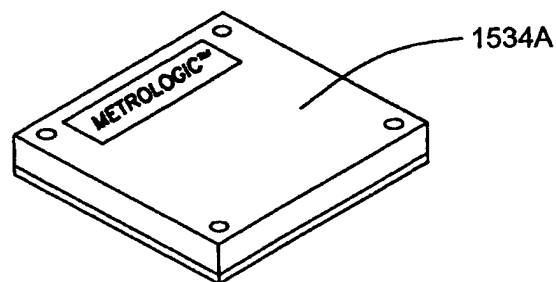


FIG. 40C5



Linear Image Array With
Vertically Elongated Image
Detection Elements

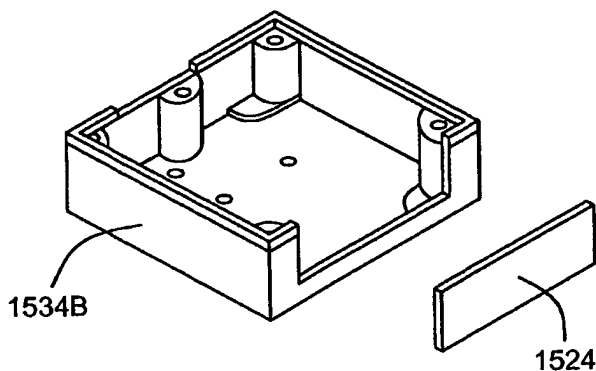
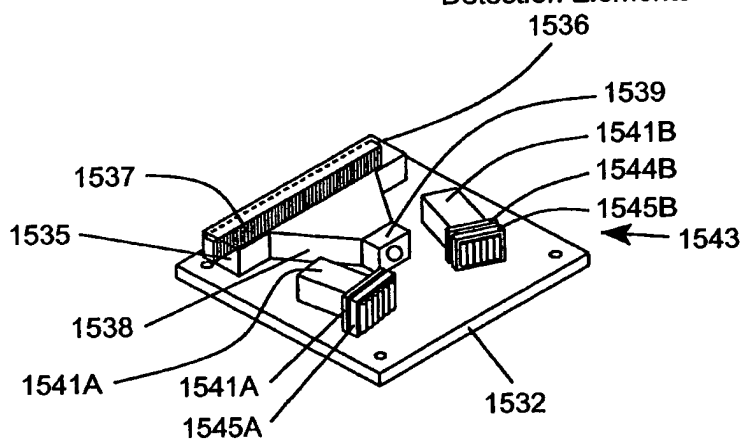


FIG. 41B

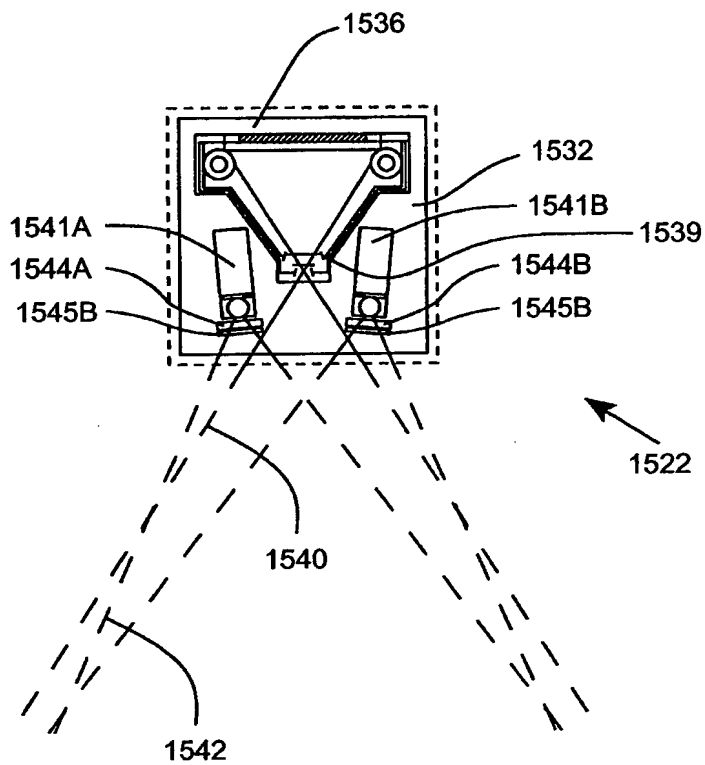


FIG. 41C

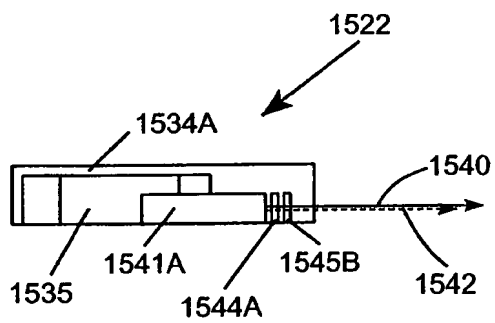


FIG. 41D

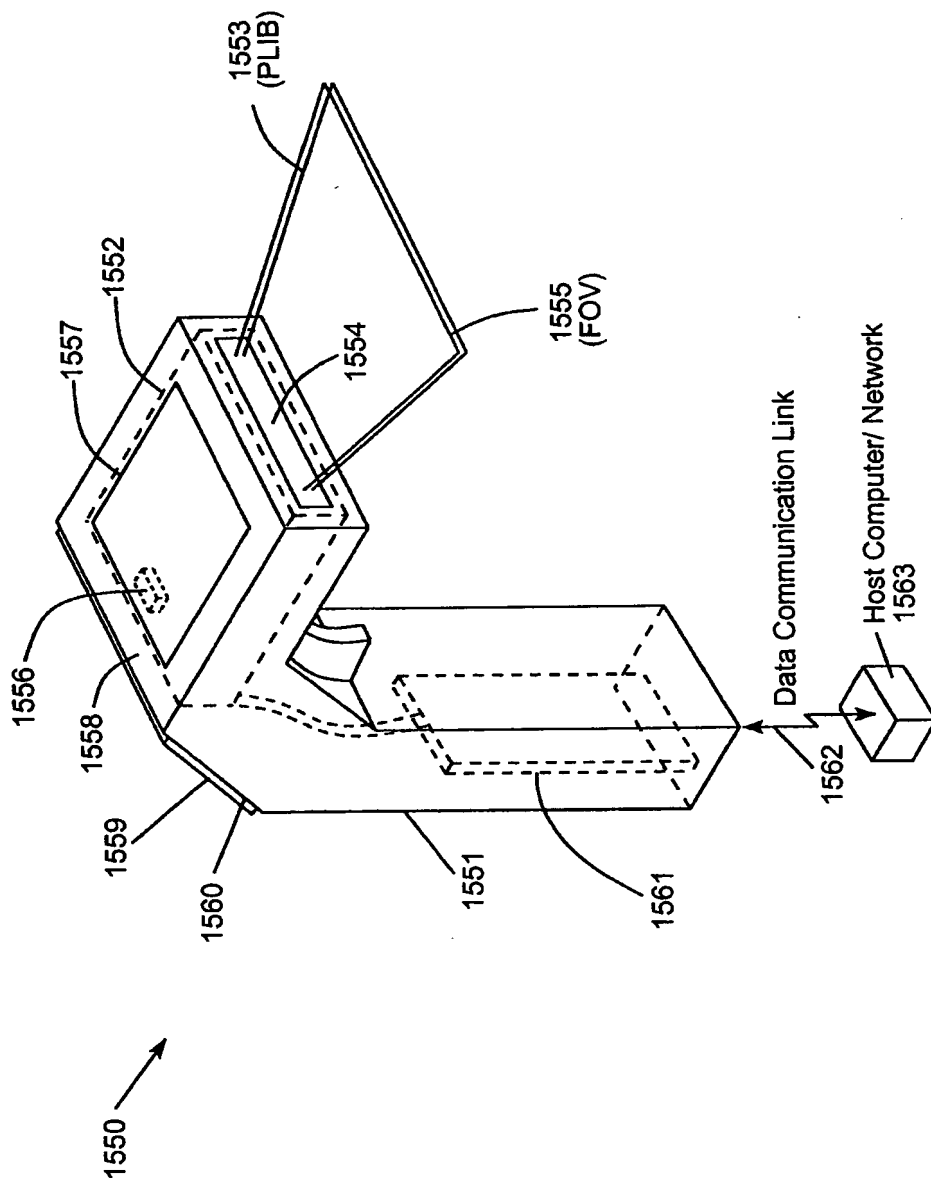


FIG. 42A

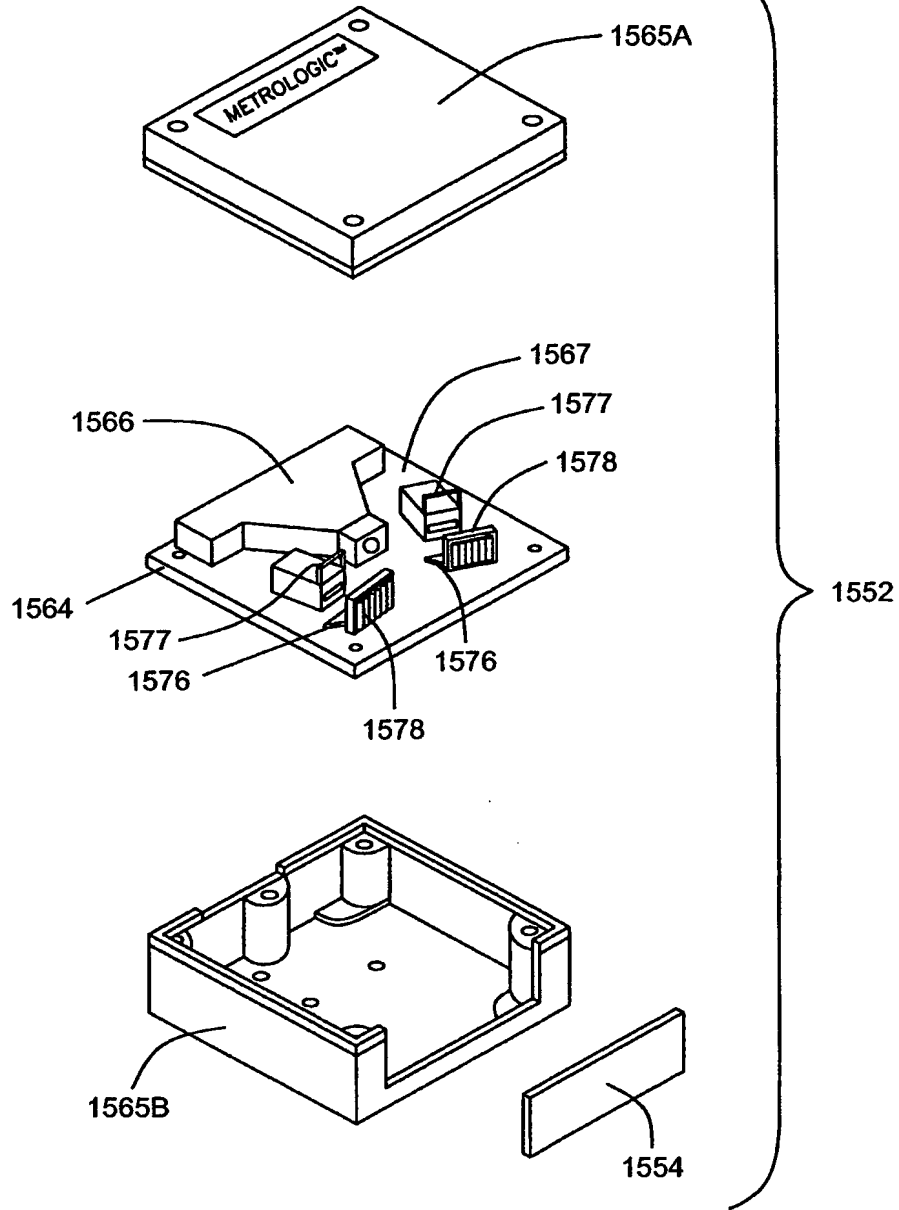


FIG. 42B

2006020704523001

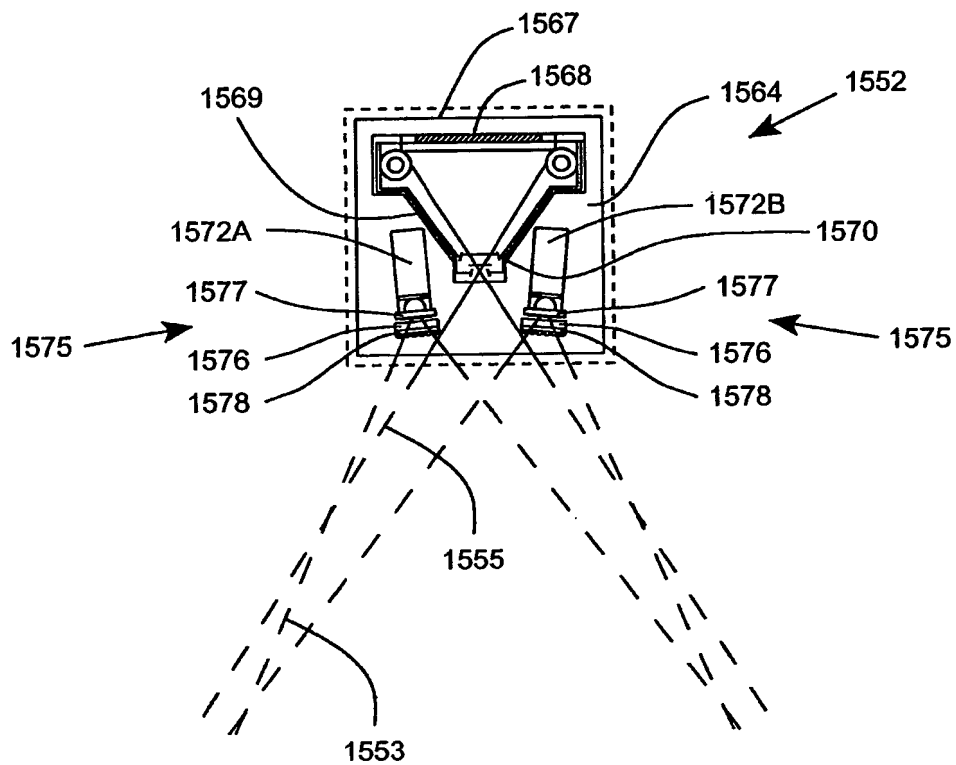


FIG. 42C

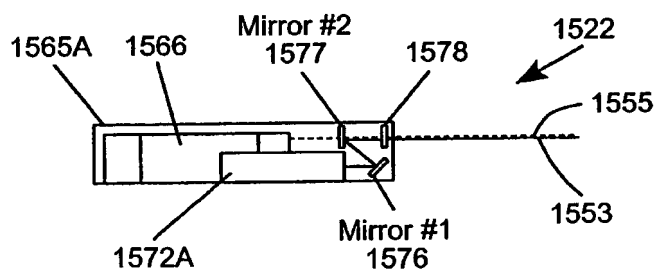


FIG. 42D

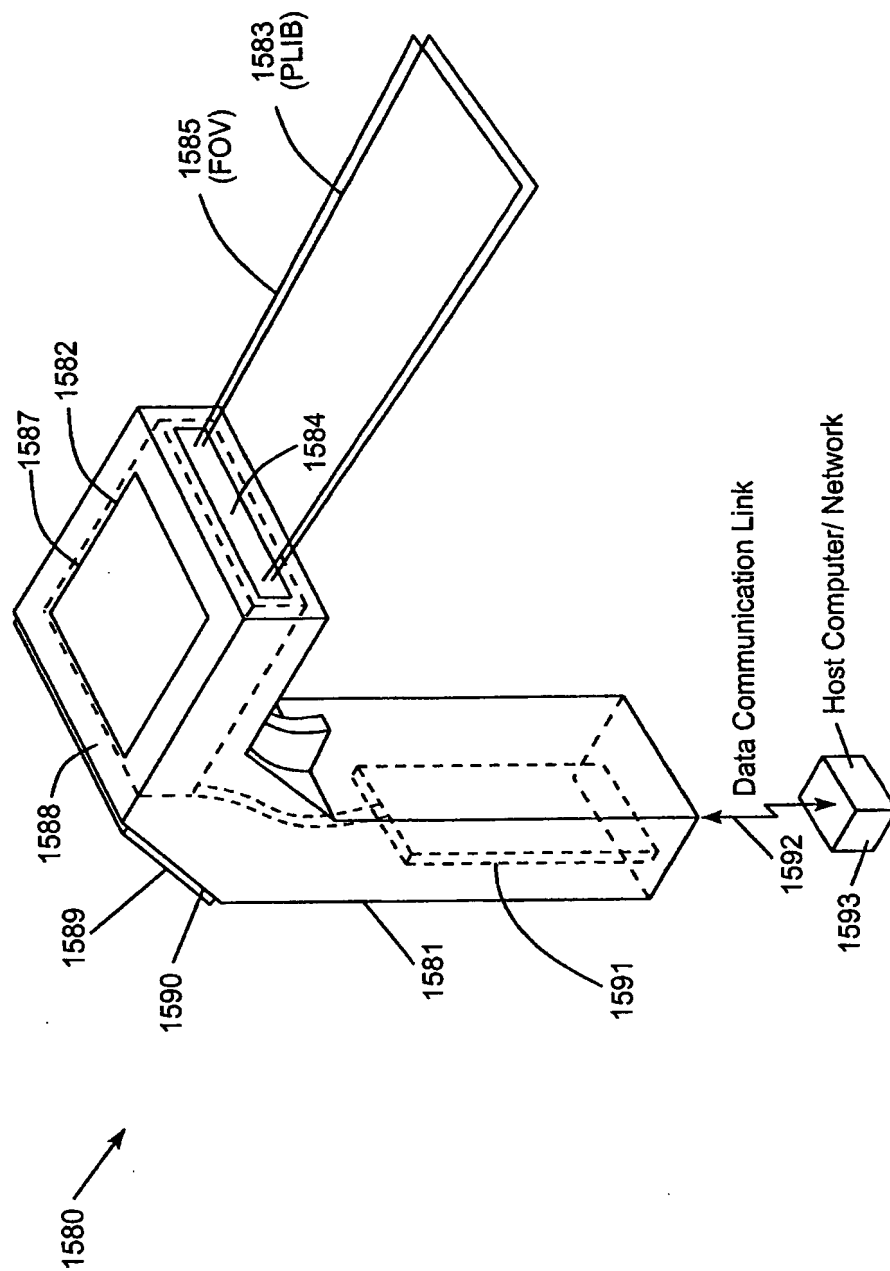


FIG. 43A

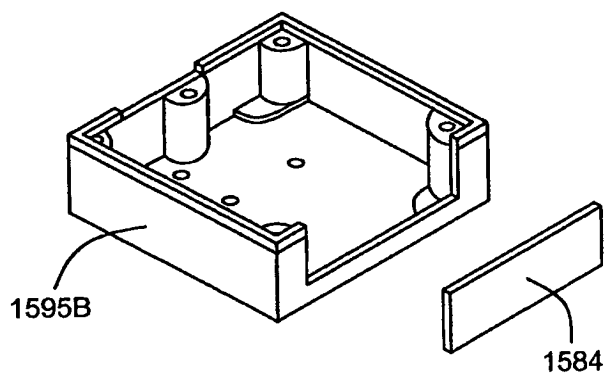
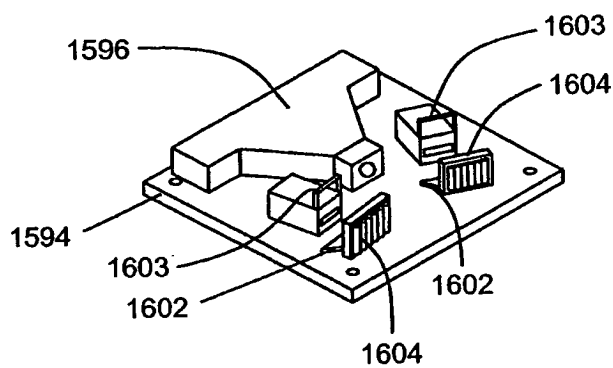
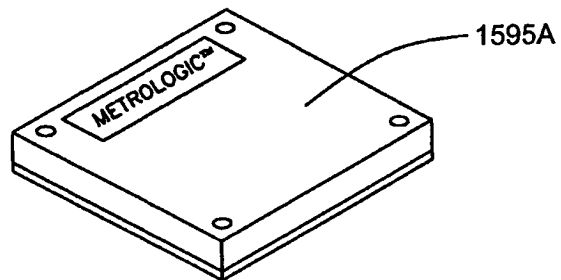


FIG. 43B

20020752900

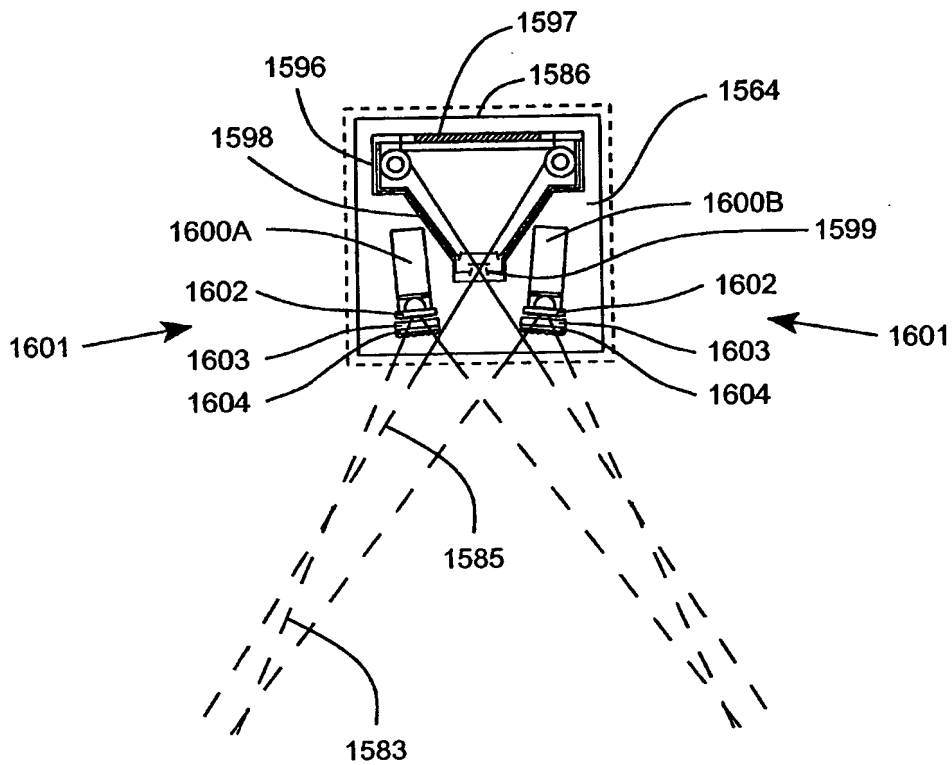


FIG. 43C

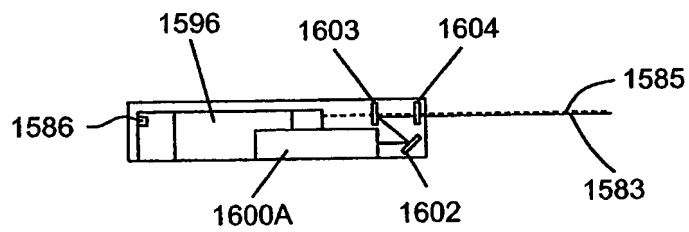


FIG. 43D

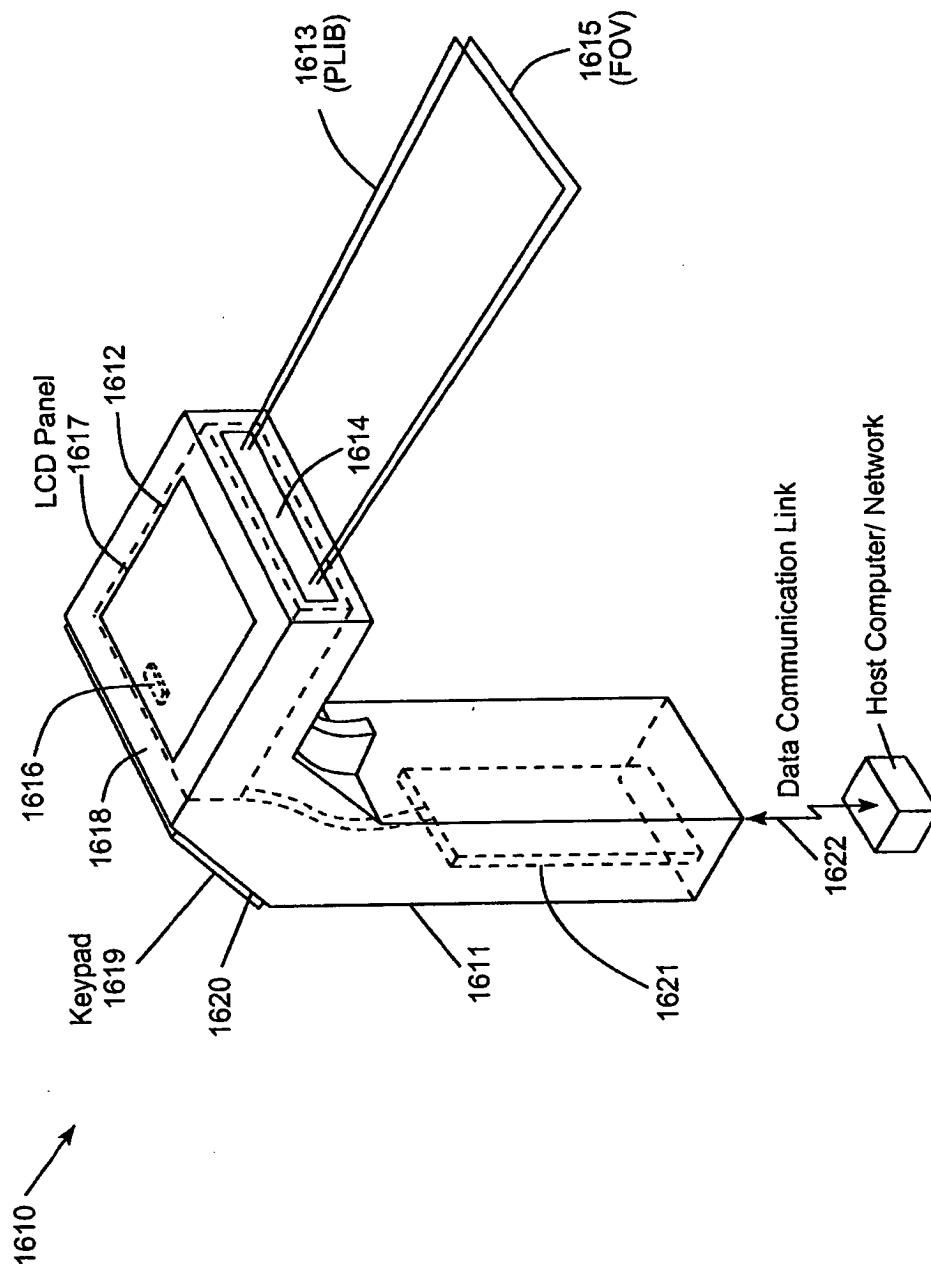


FIG. 44A

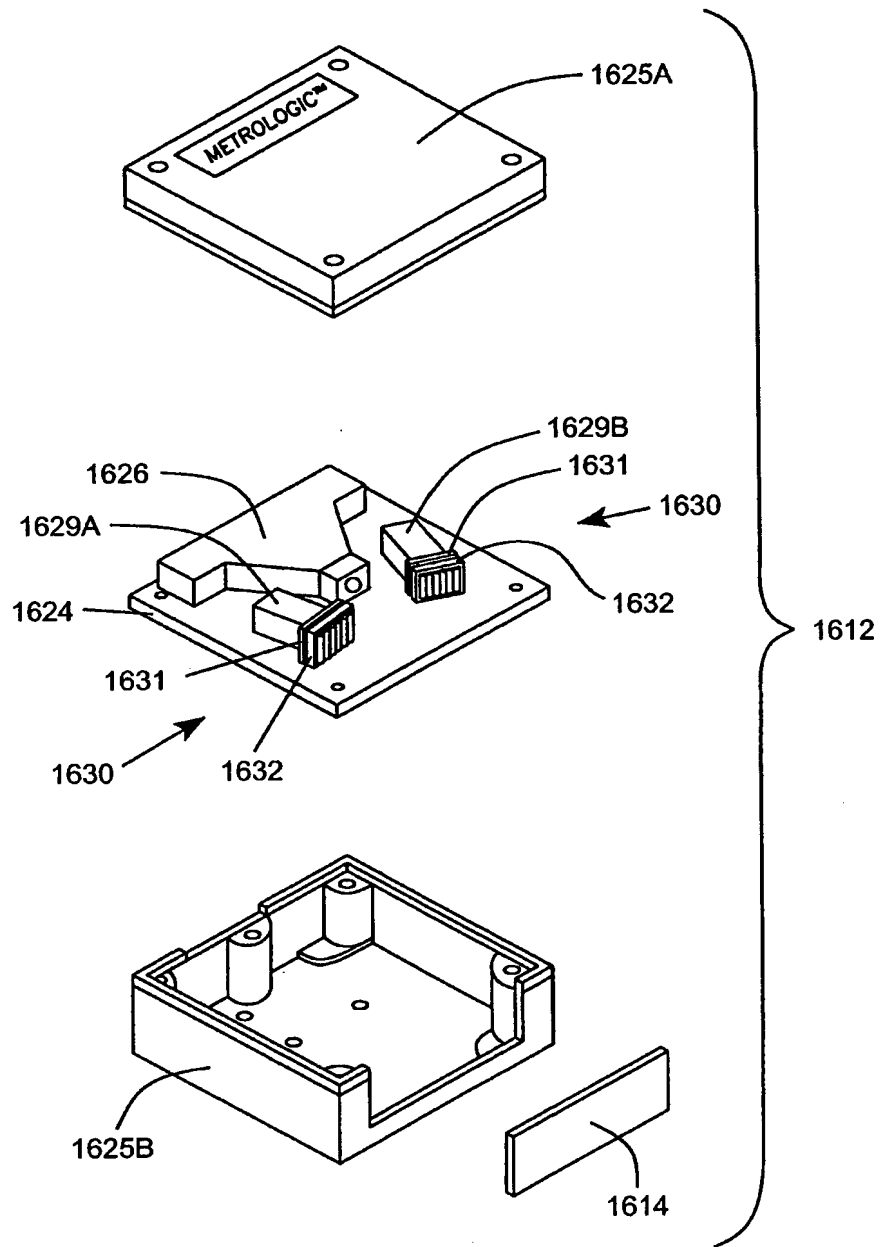


FIG. 44B

20060407 04529001

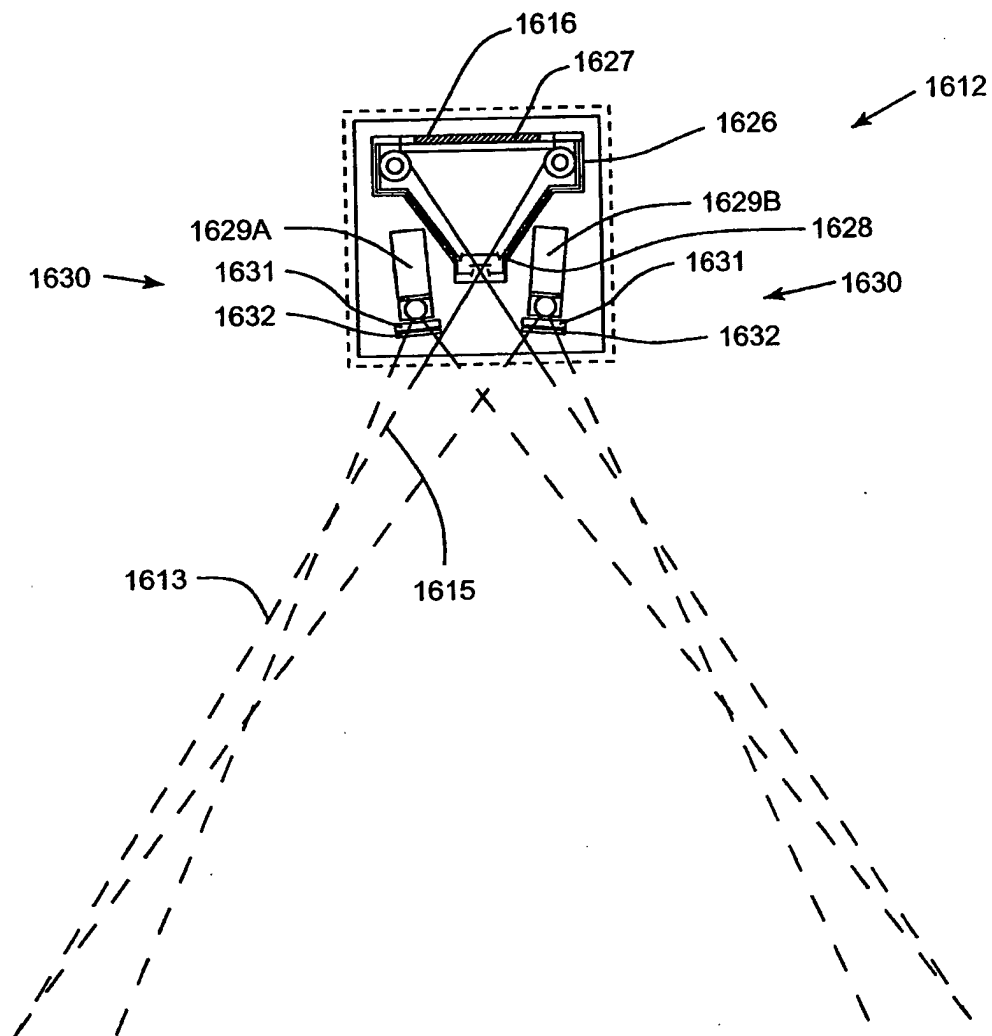


FIG. 44C

20060207 04525007

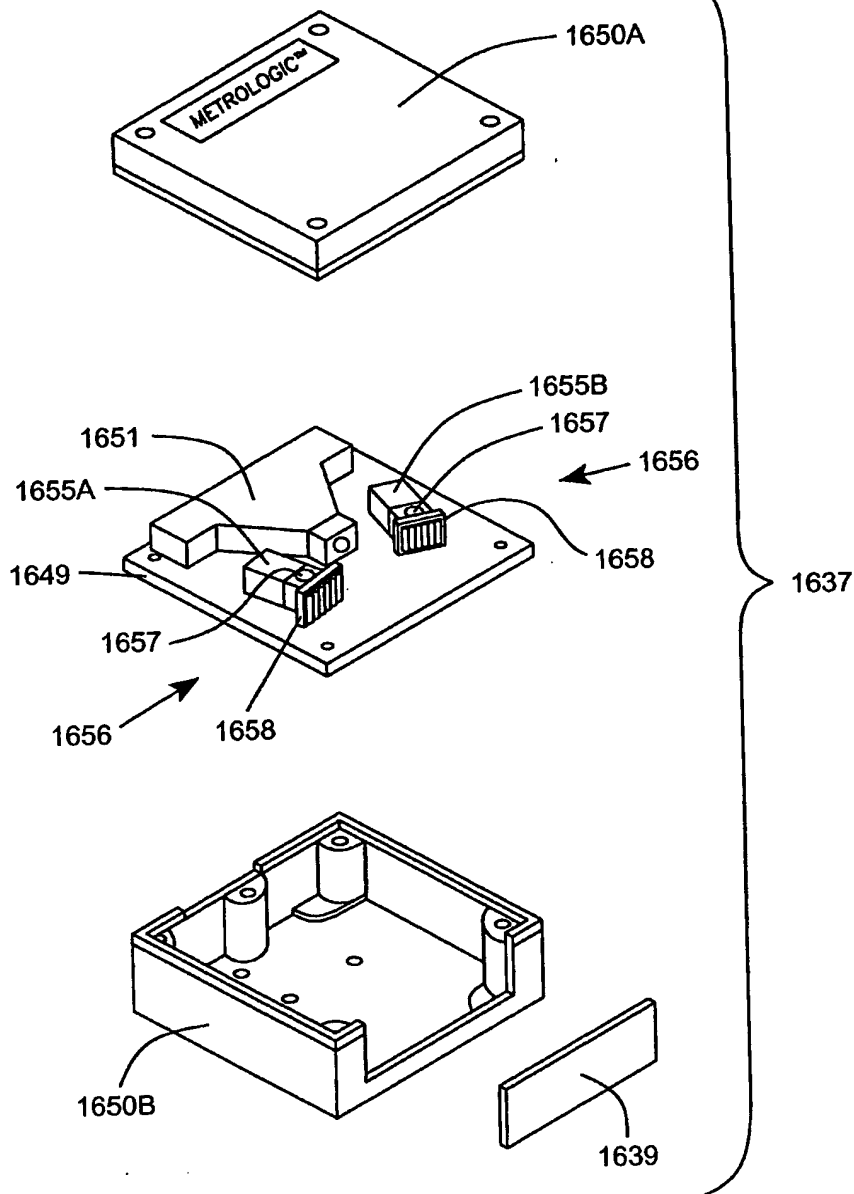


FIG. 45B

2000 04 20 09 32 30

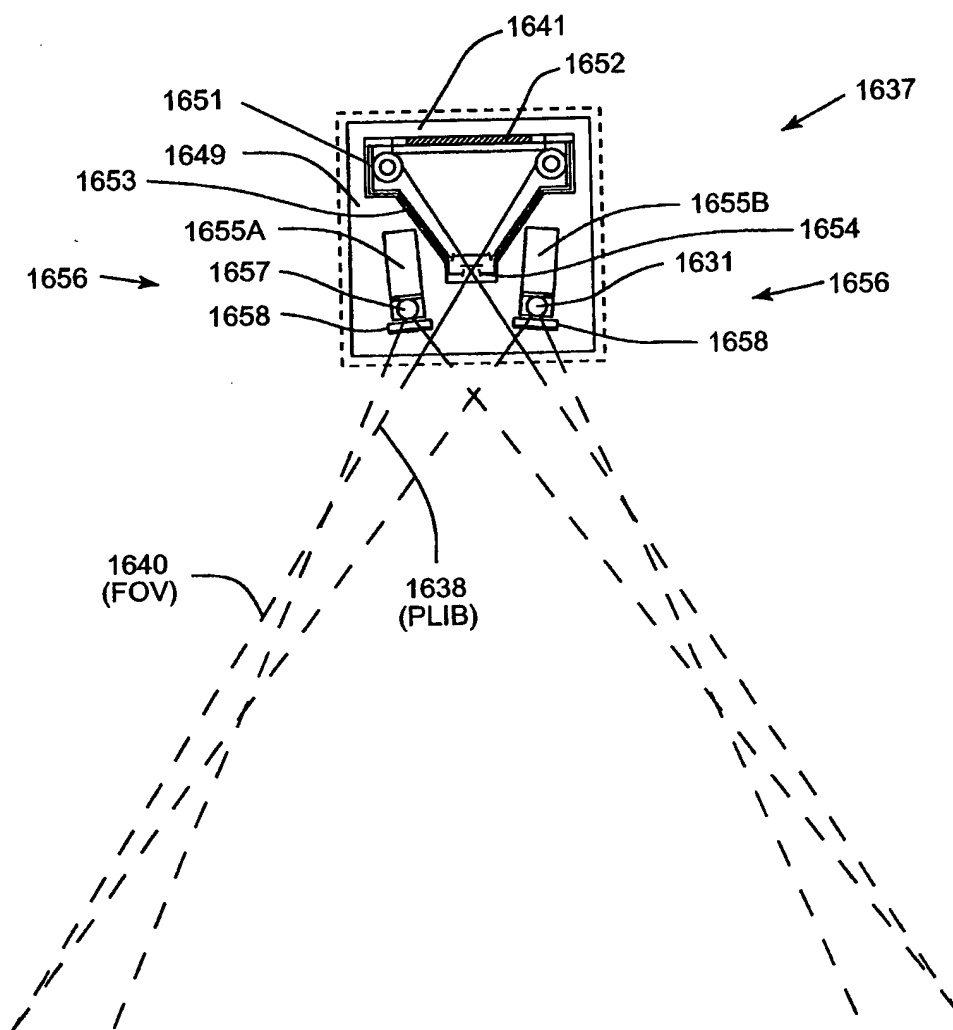


FIG. 45C

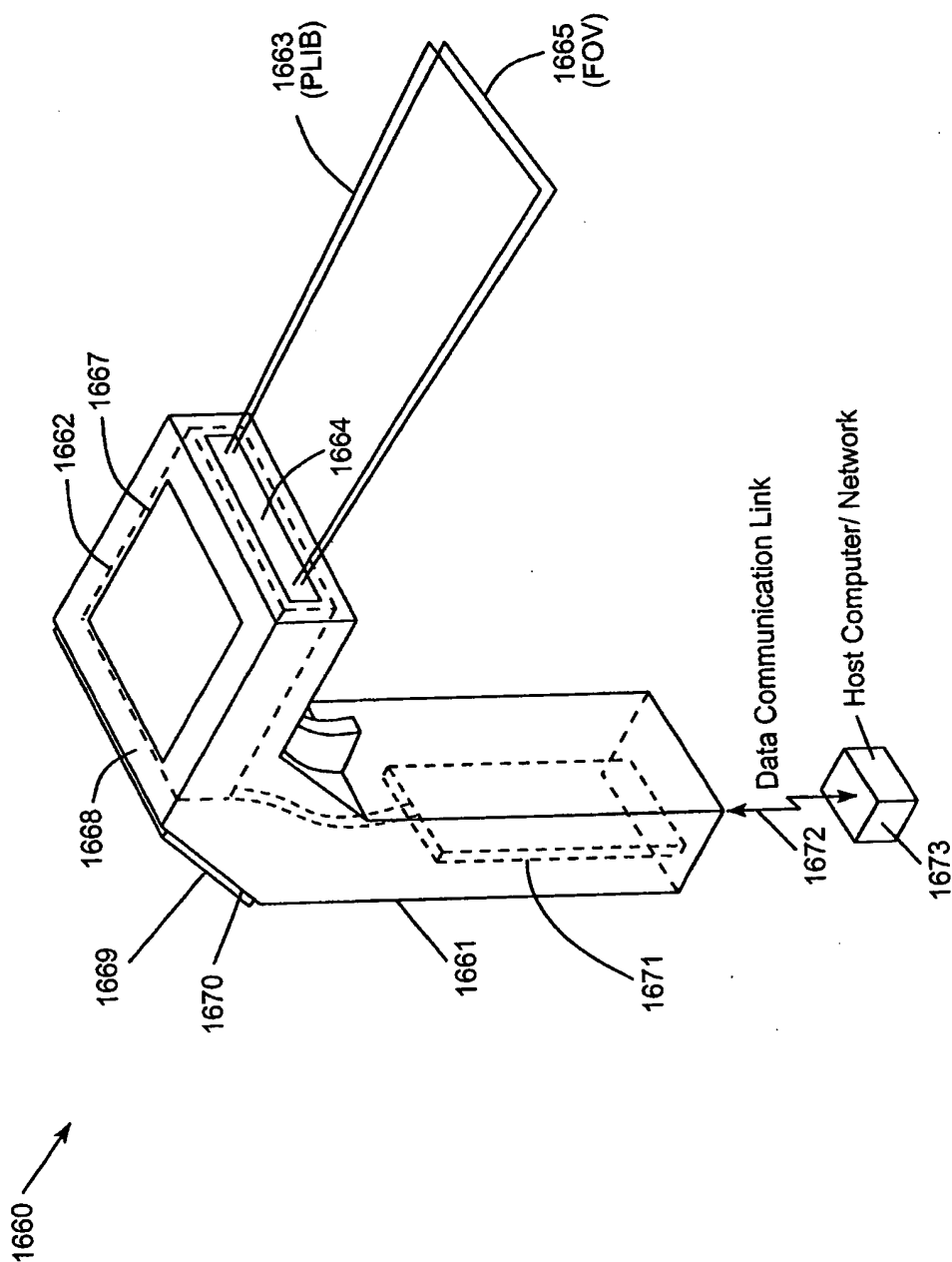


FIG. 46A

20060207 04523001

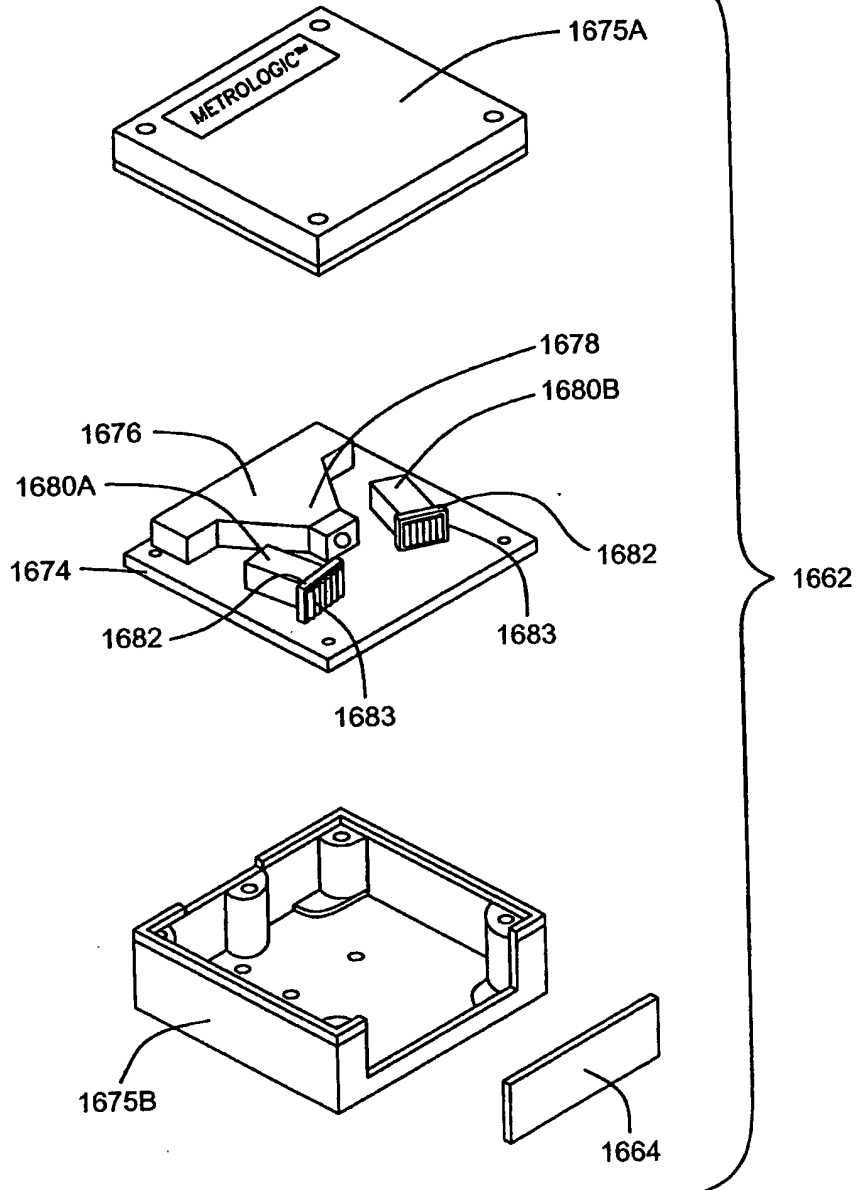


FIG. 46B

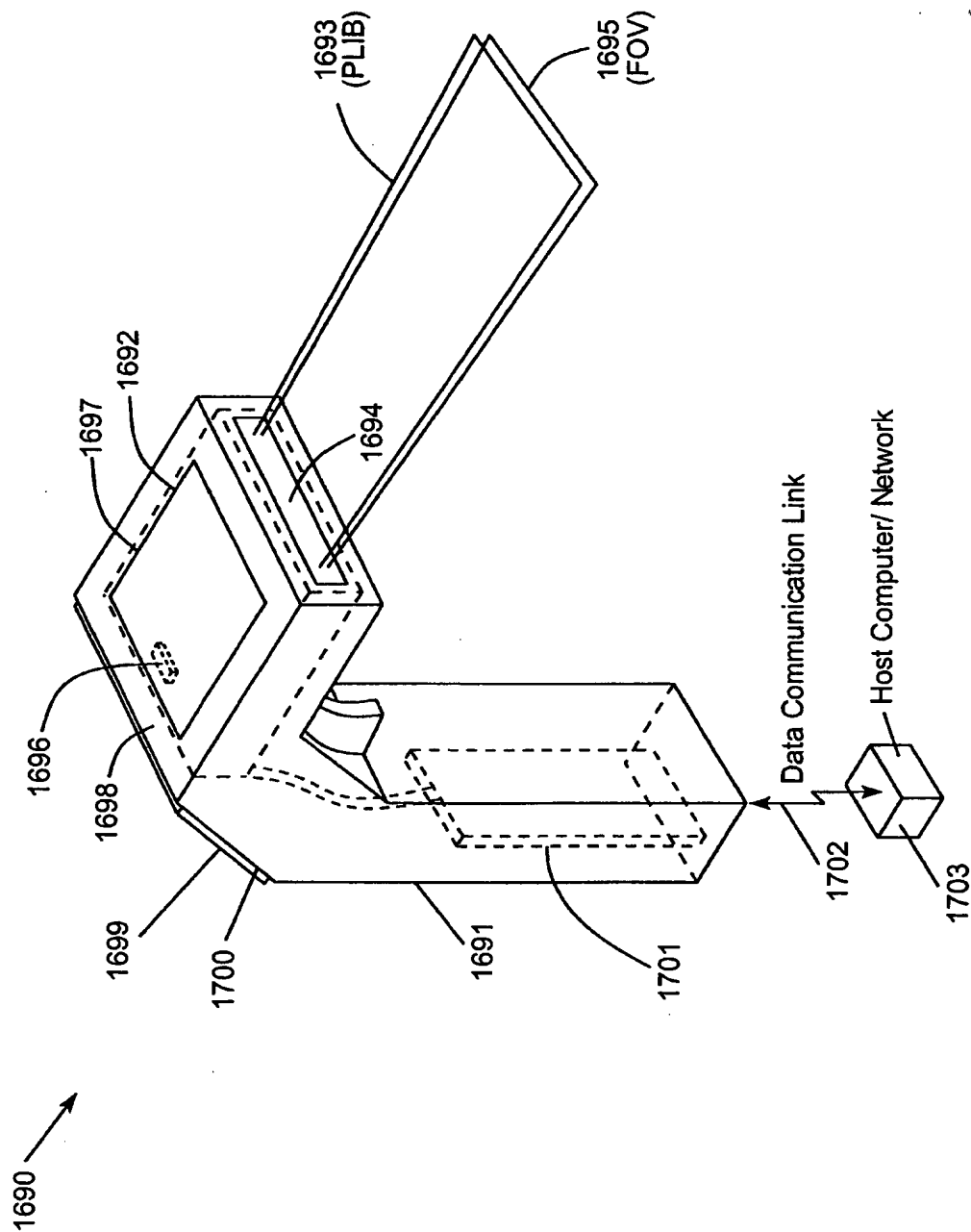


FIG. 47A

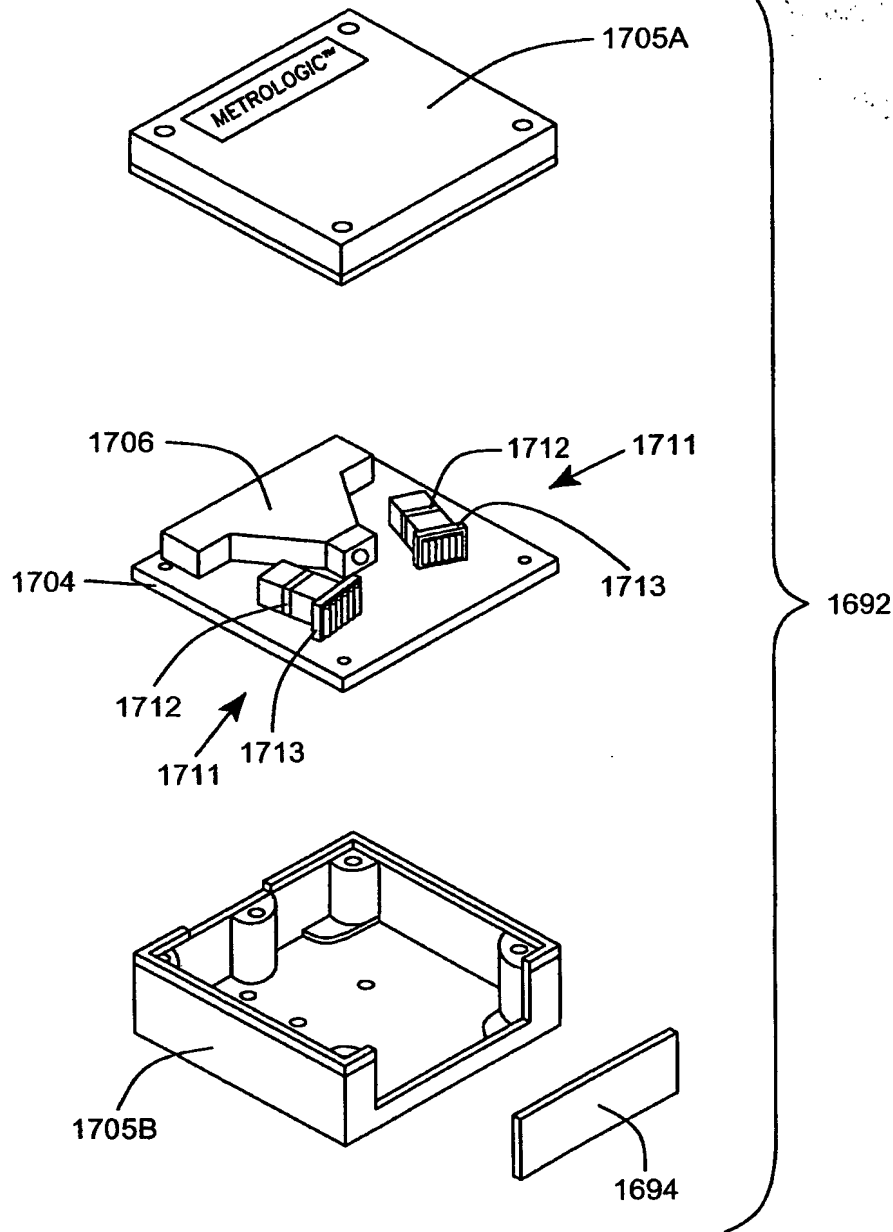


FIG. 47B

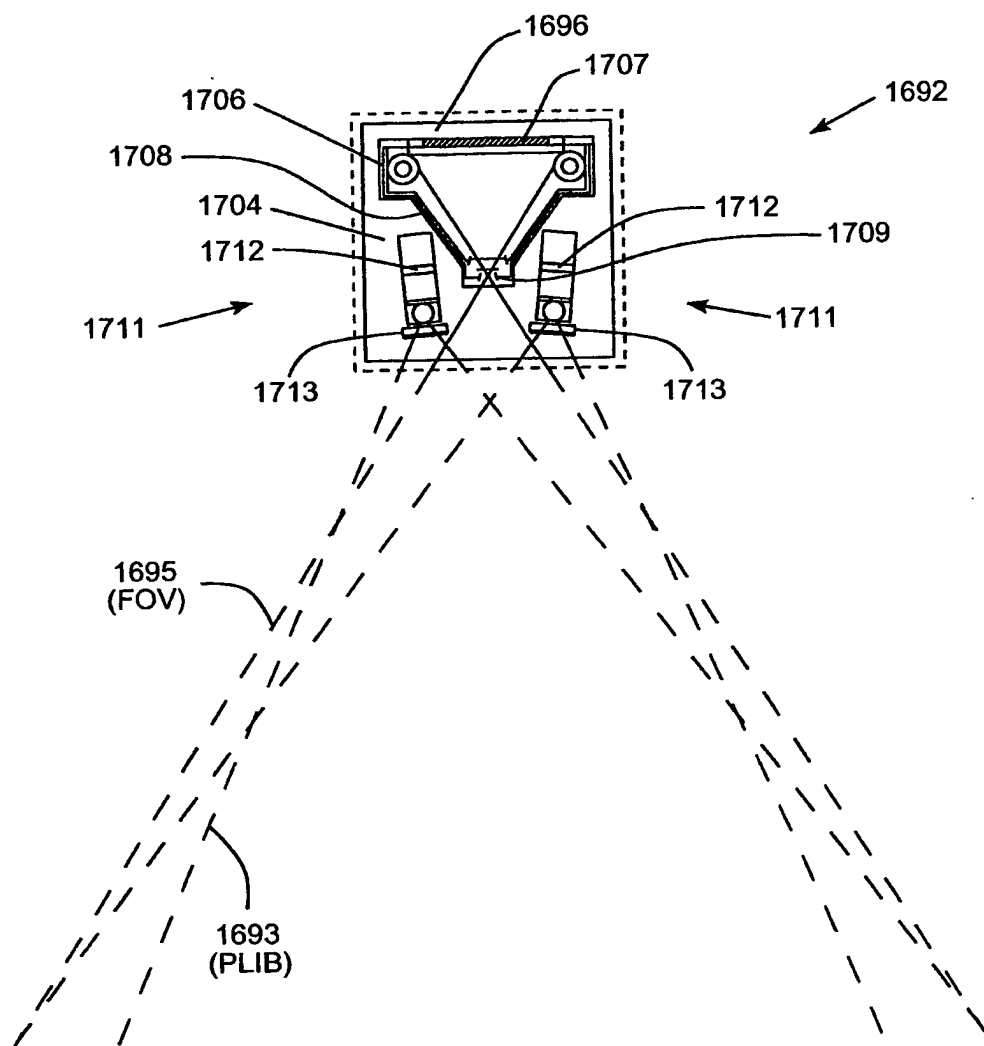


FIG. 47C

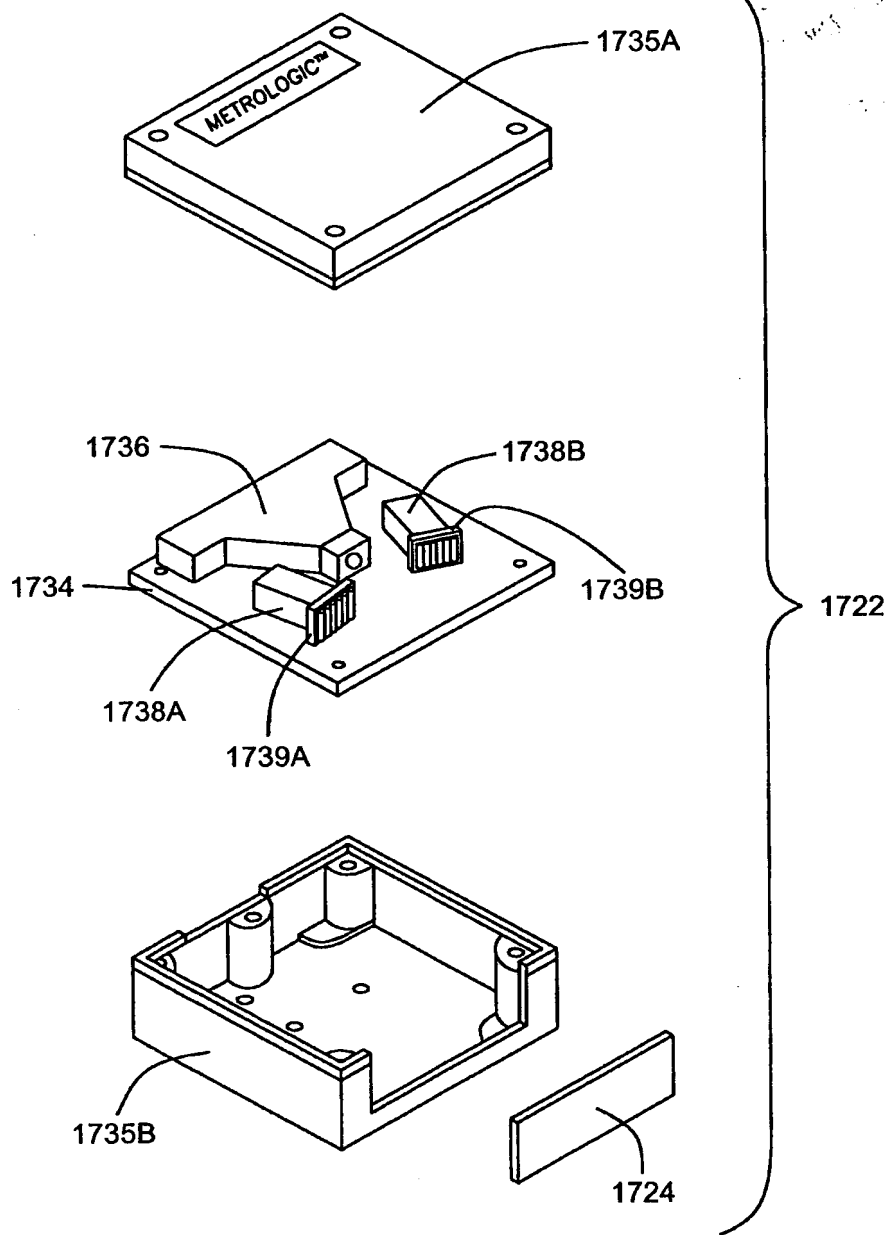


FIG. 48B

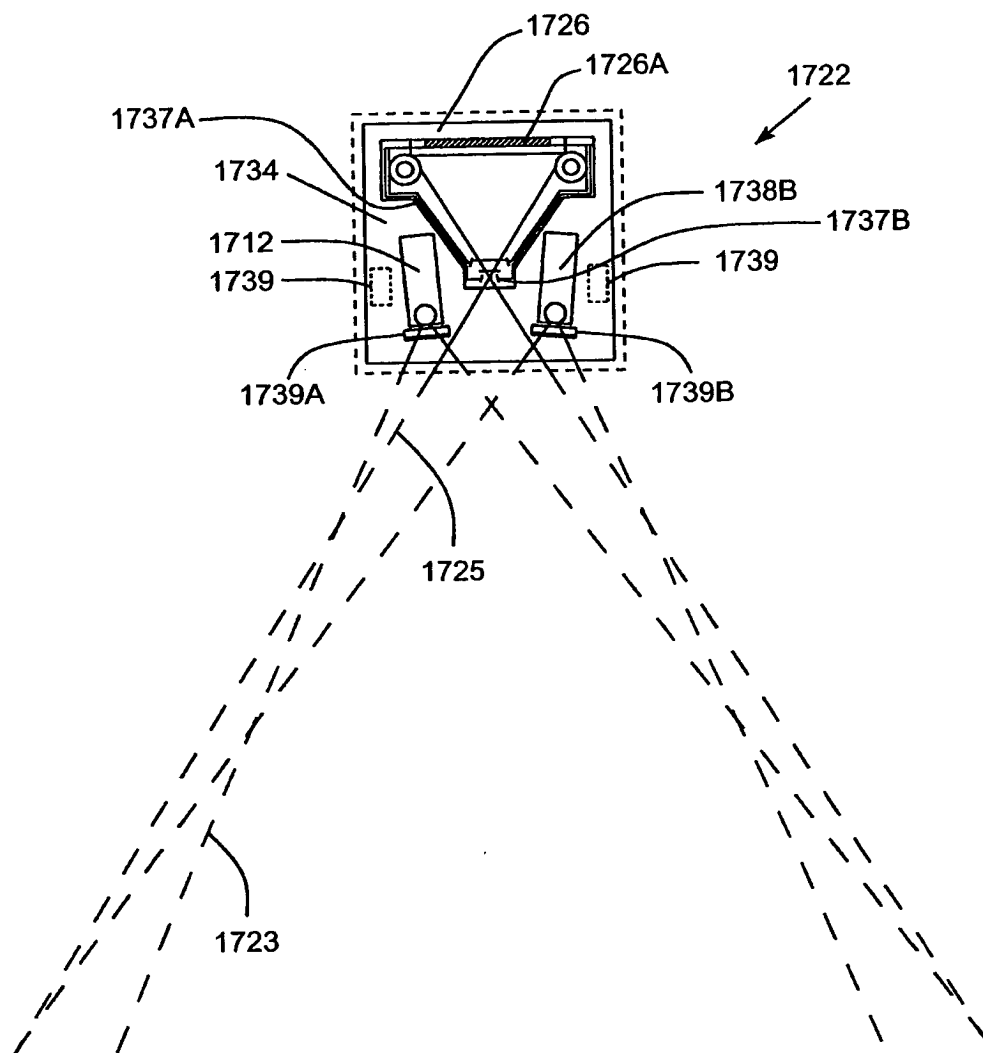


FIG. 48C

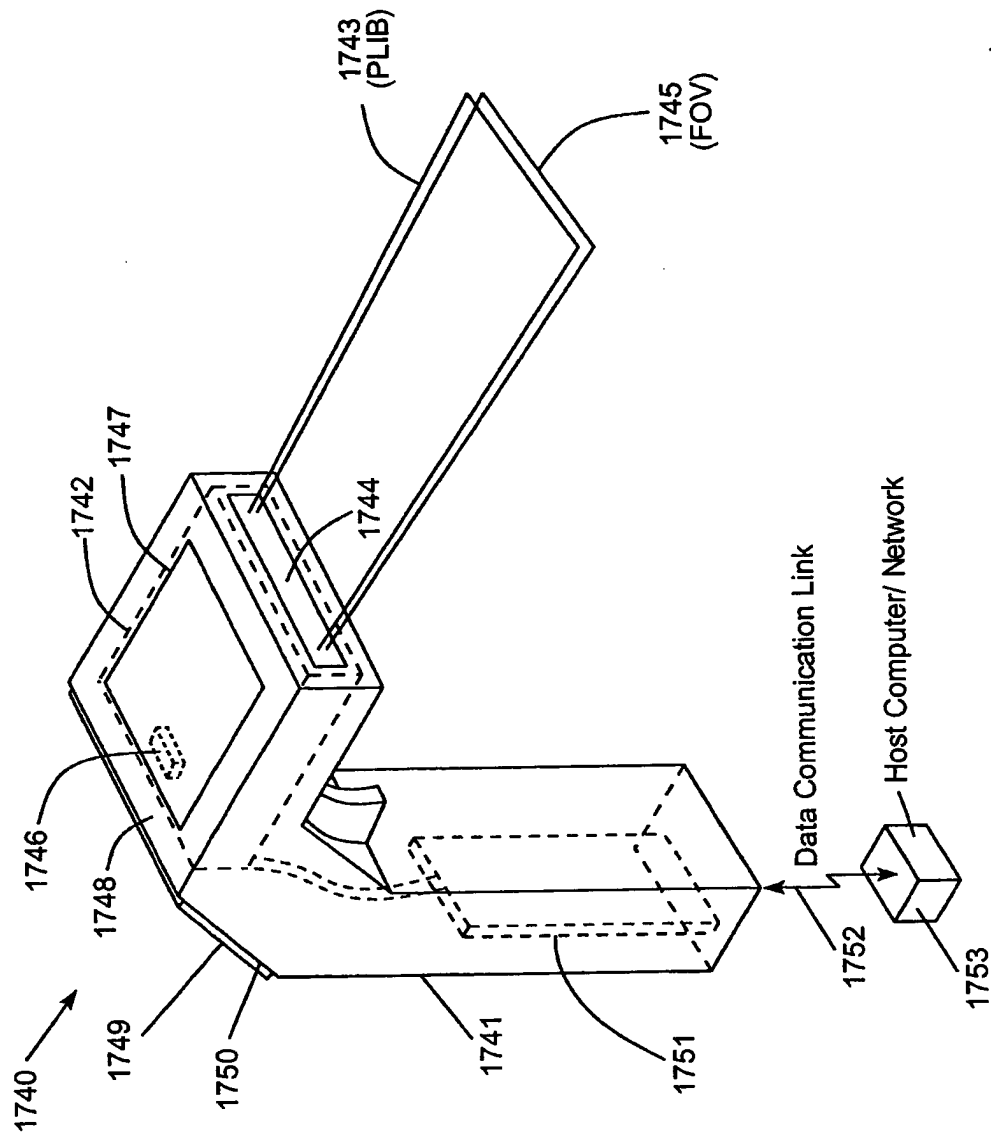


FIG. 49A

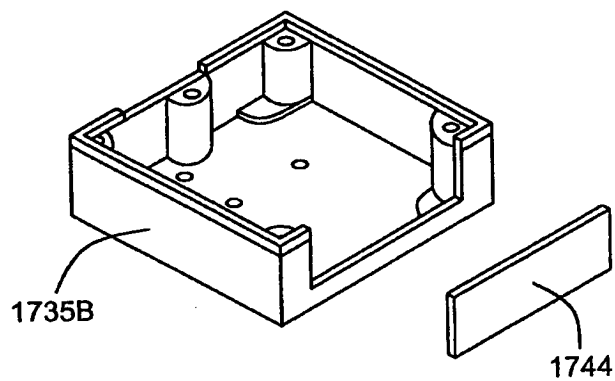
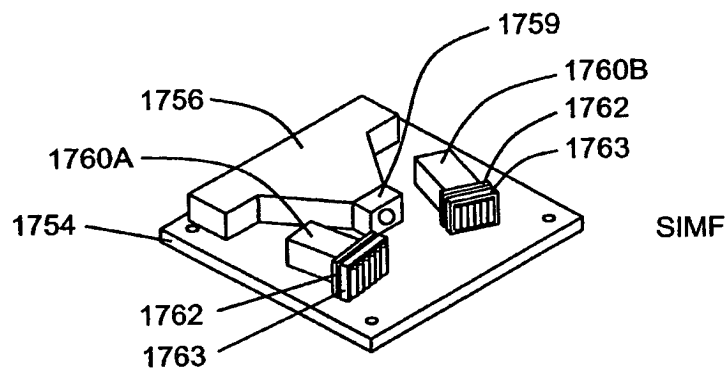
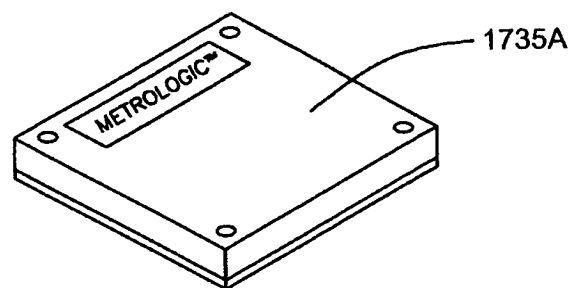


FIG. 49B

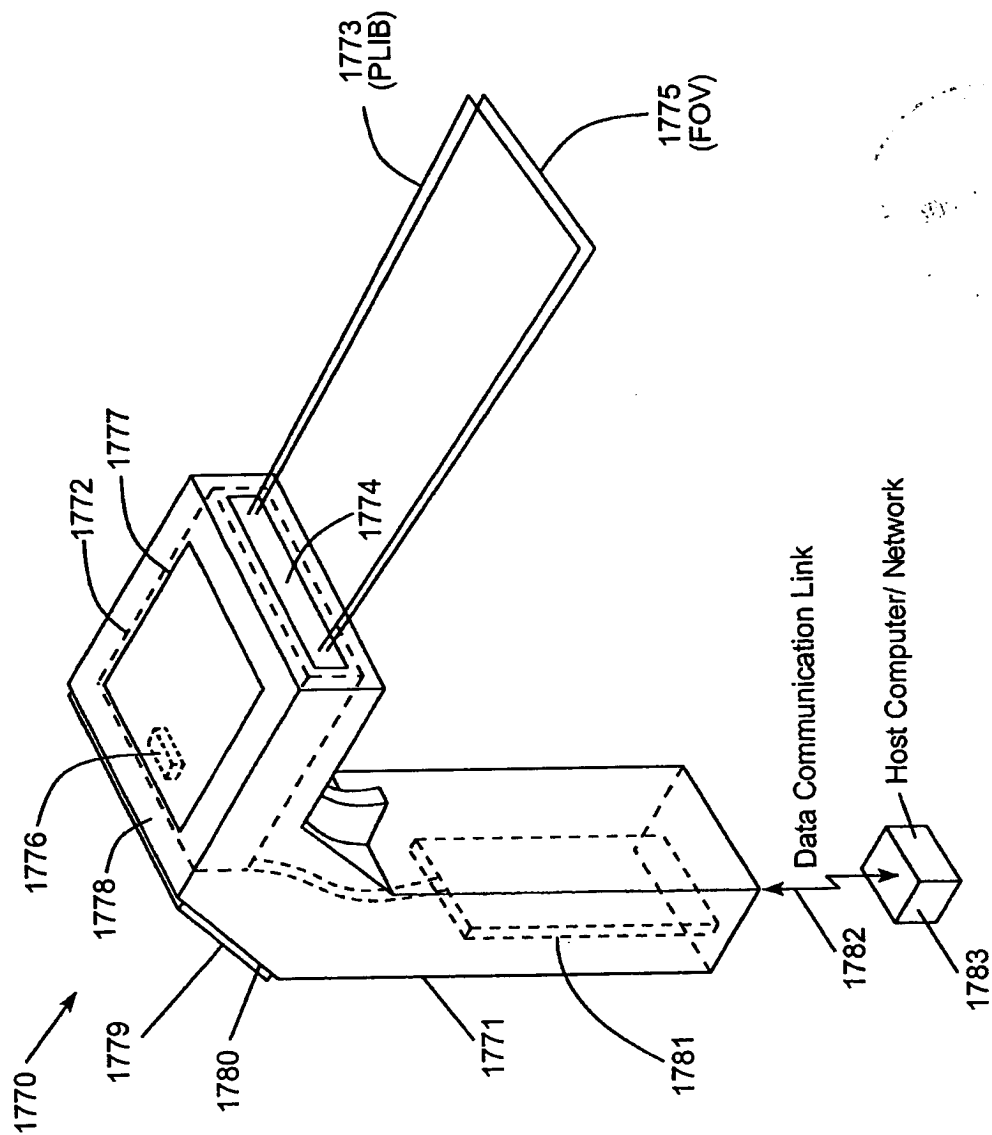


FIG. 50A

20060207 04523001

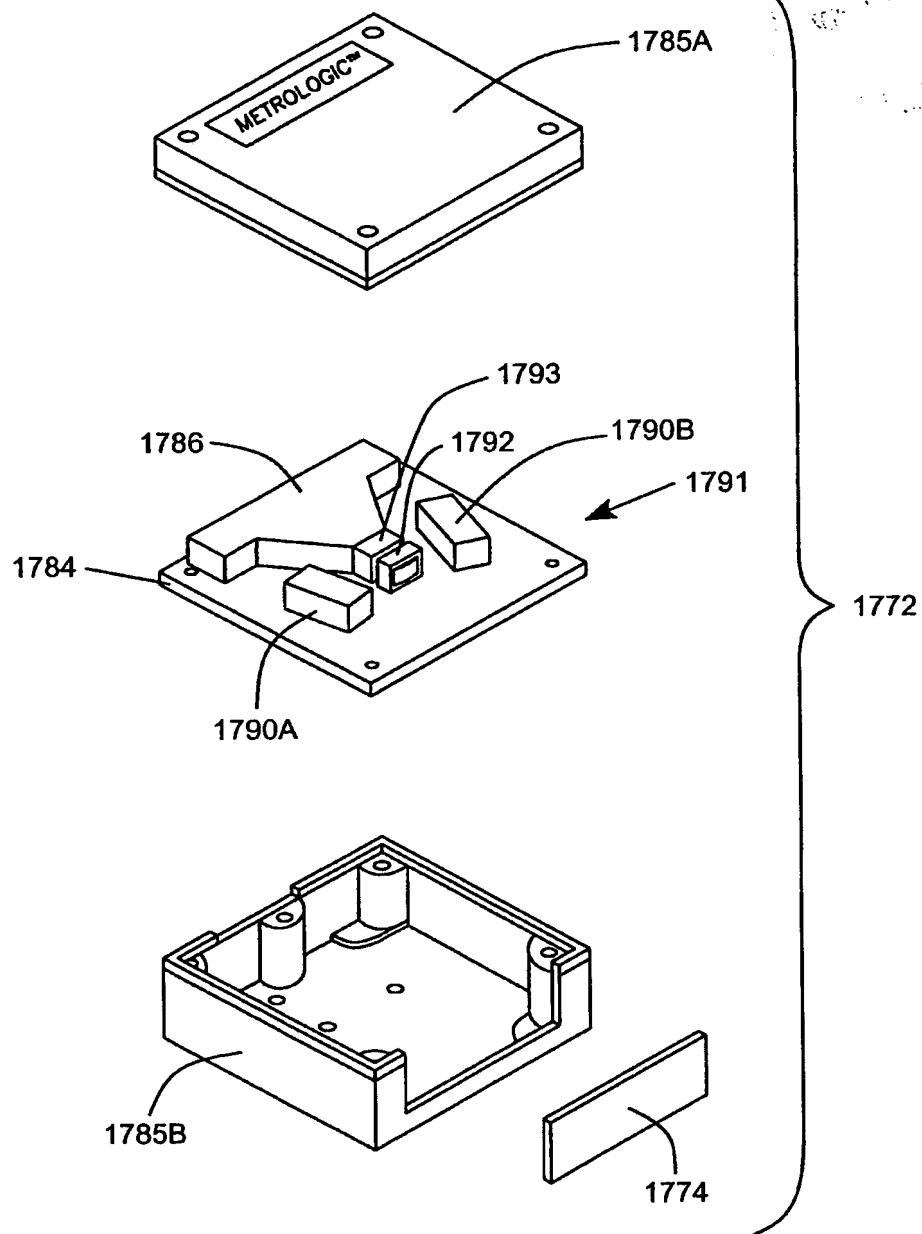


FIG. 50B

FIG. 50C

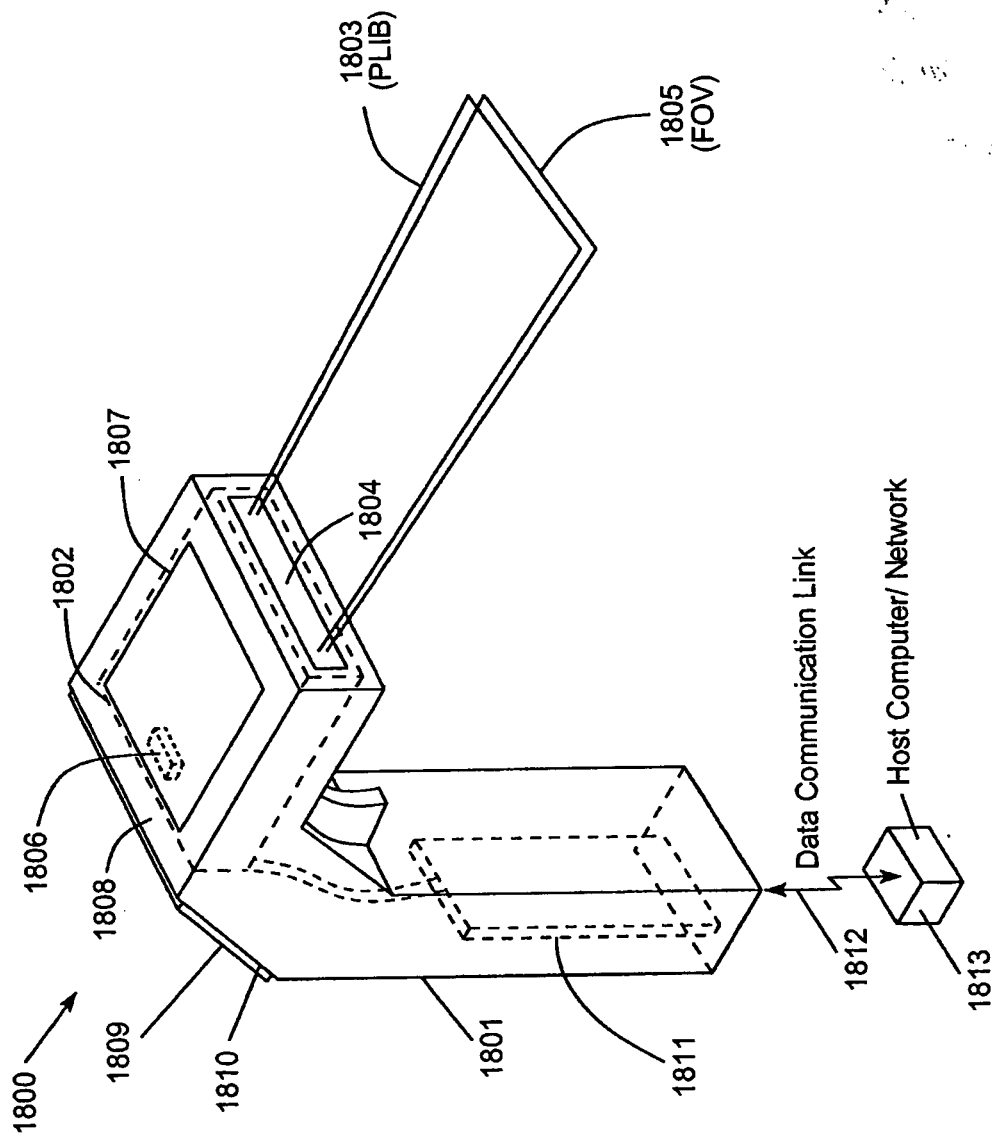


FIG. 51A

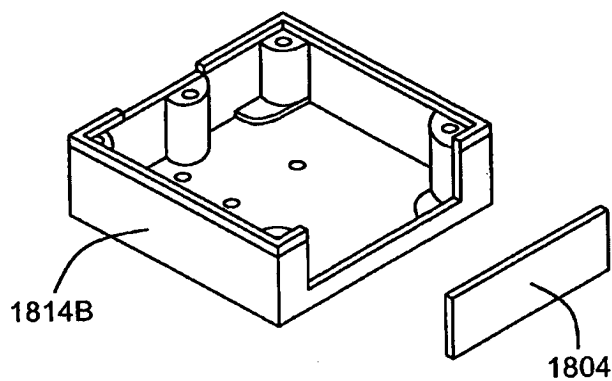
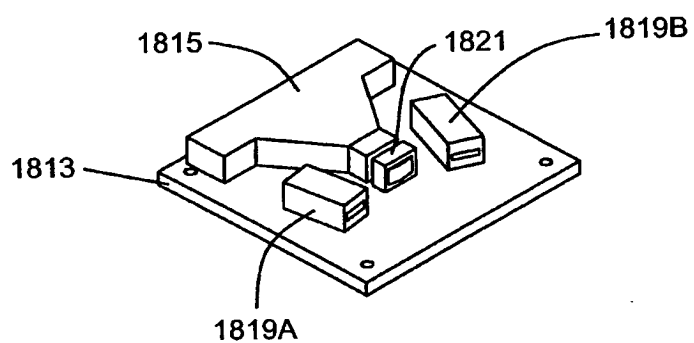
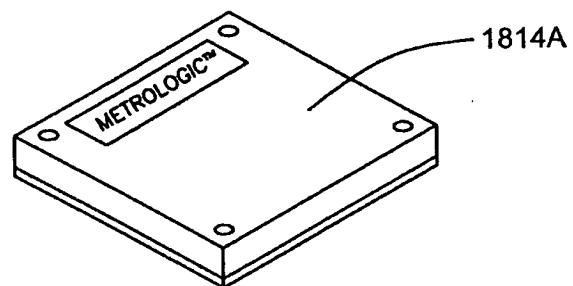


FIG. 51B

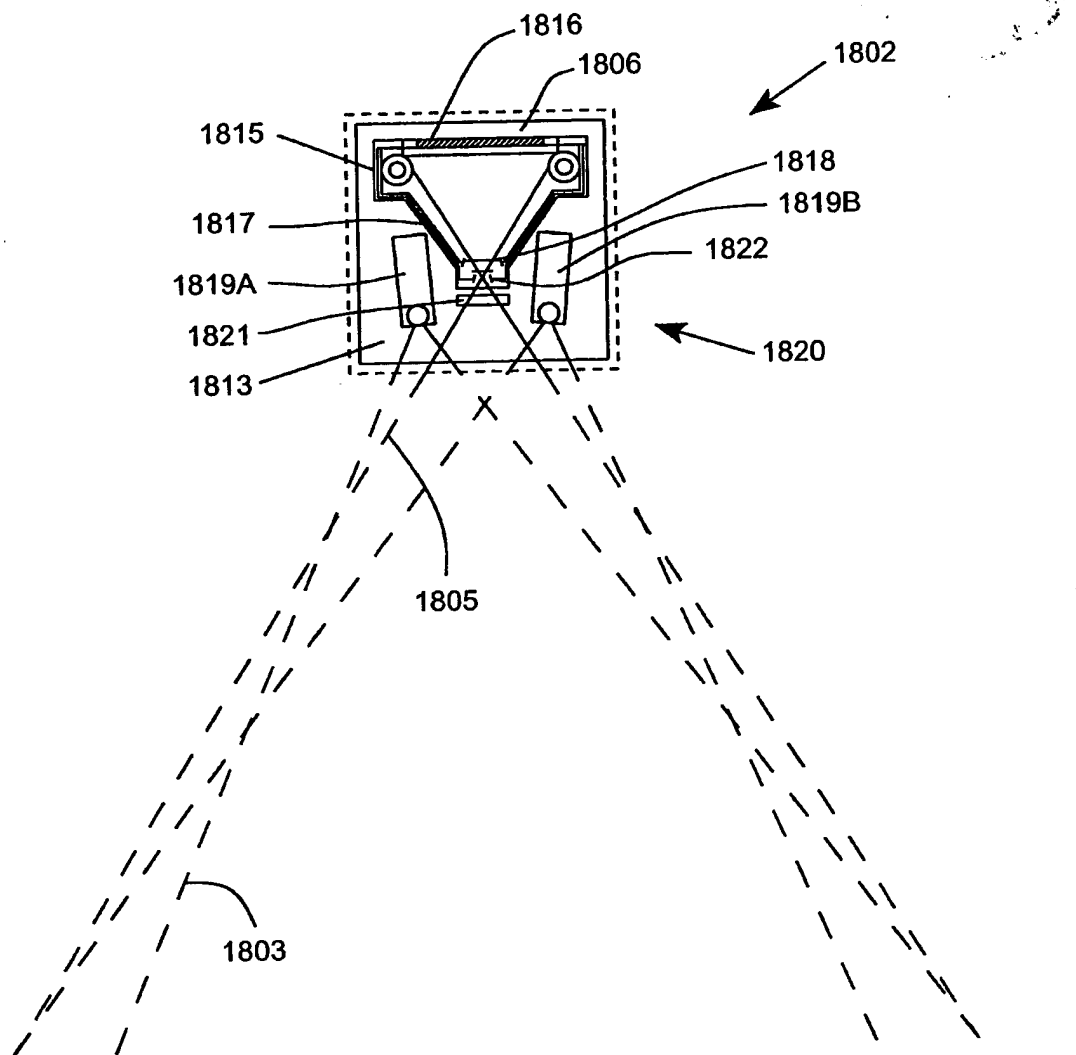


FIG. 51C

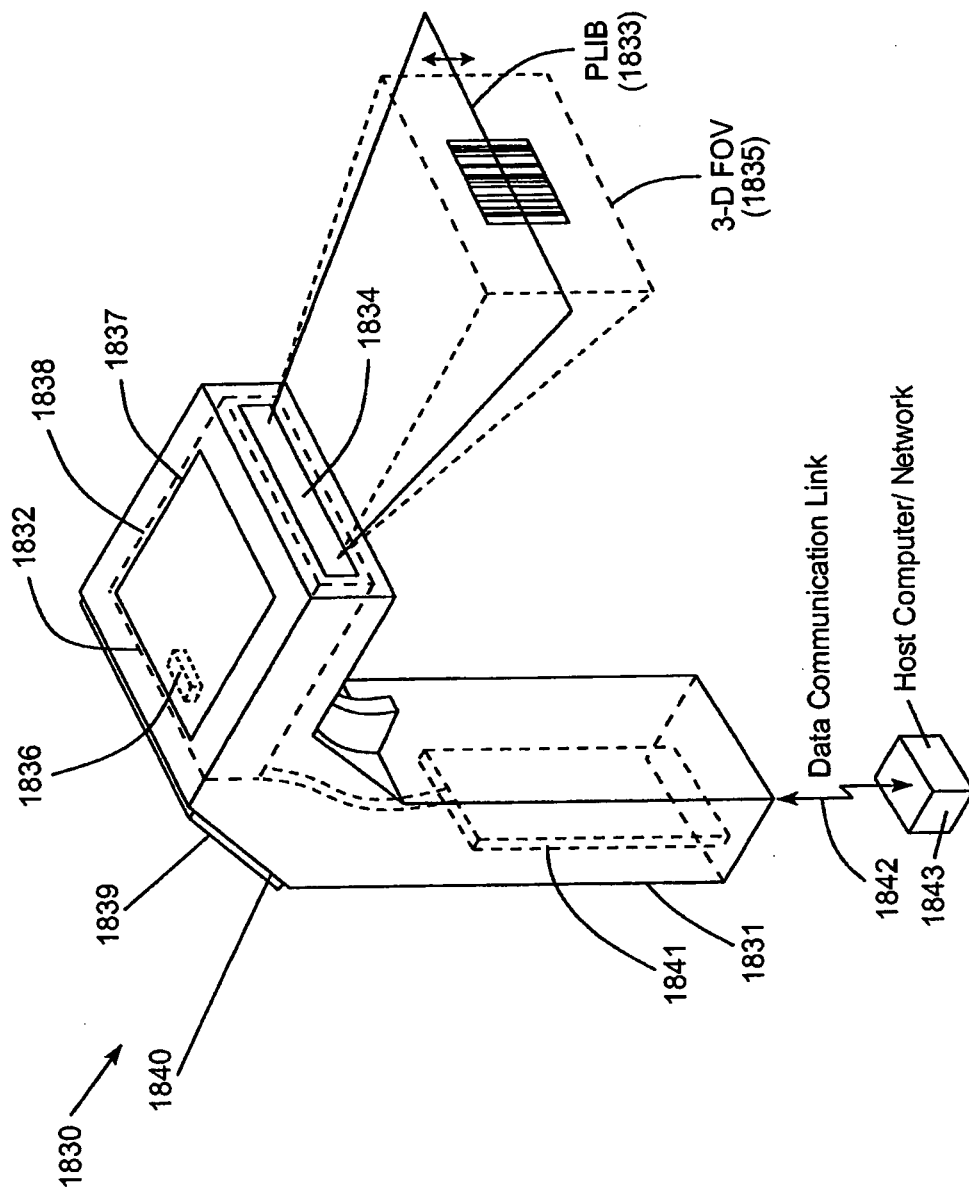


FIG. 52A

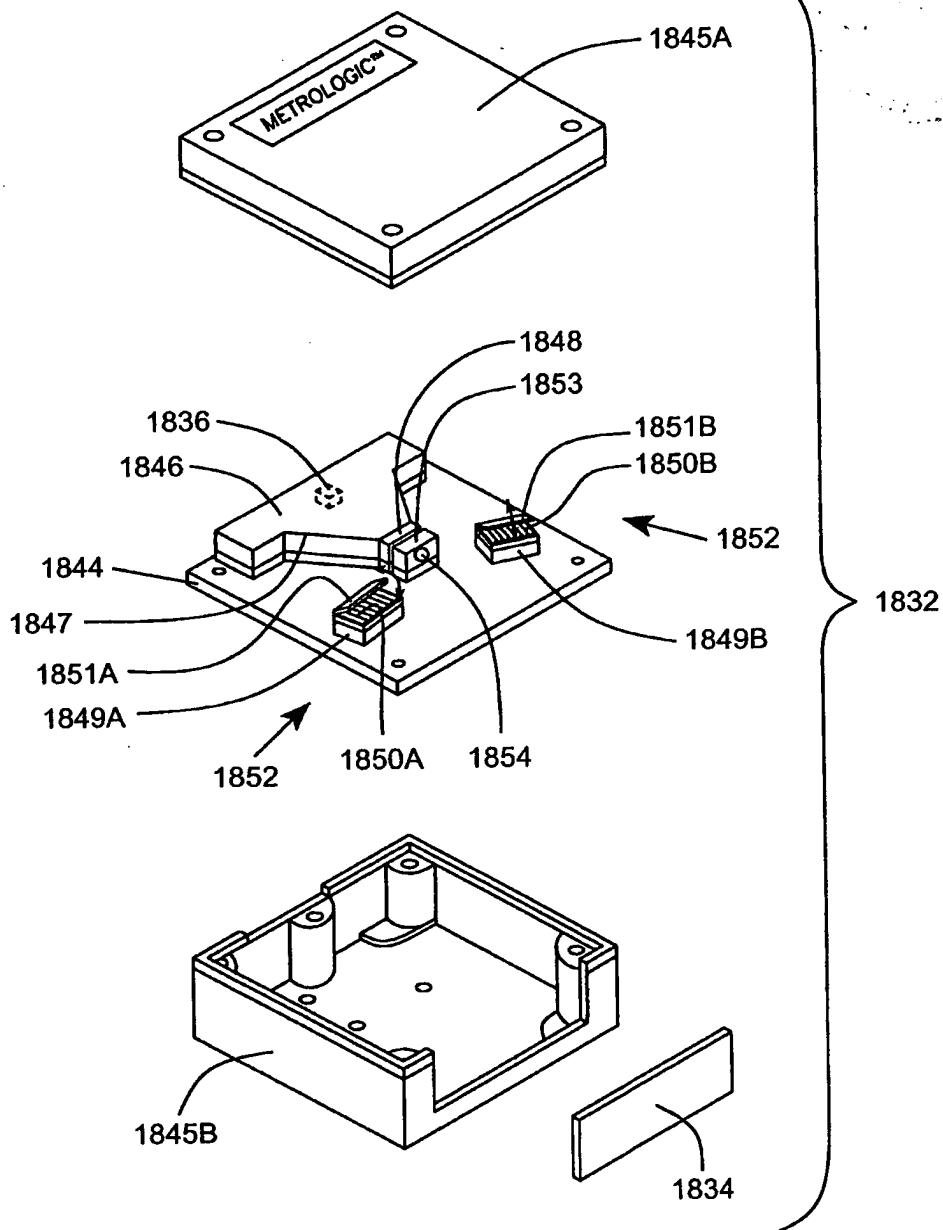


Fig. 113A-3B

FIG. 52B

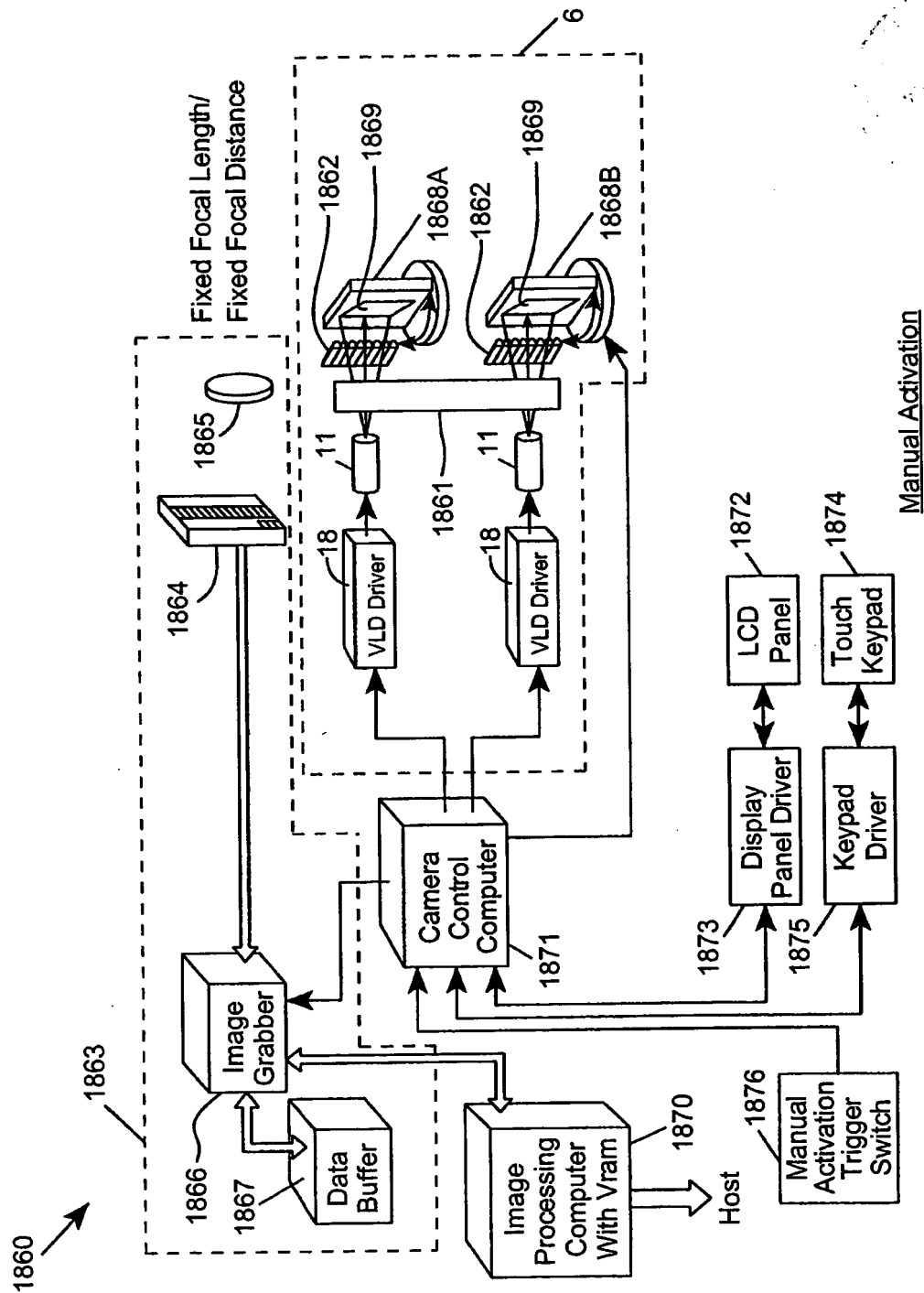


FIG. 53A1

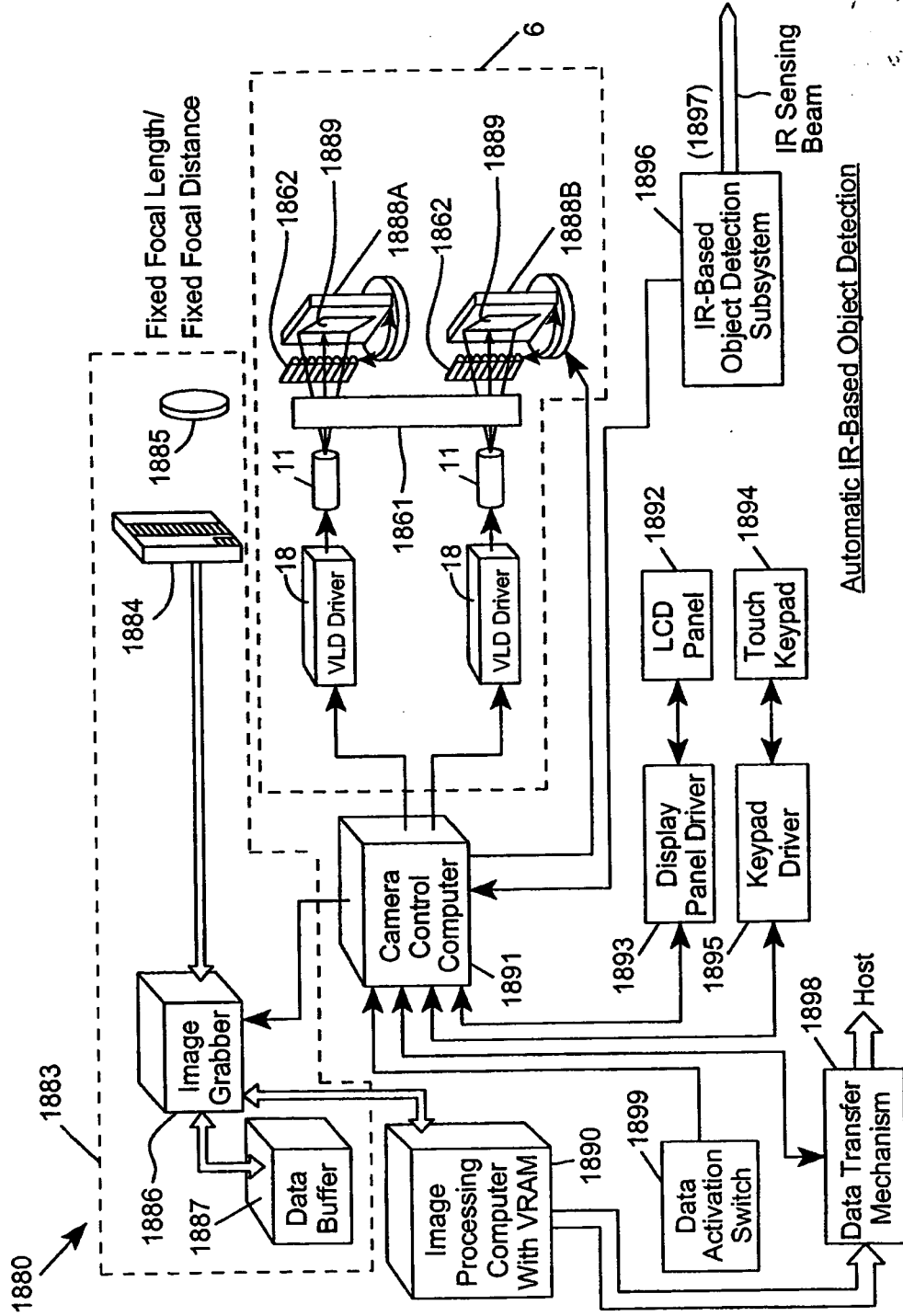


FIG. 53A2

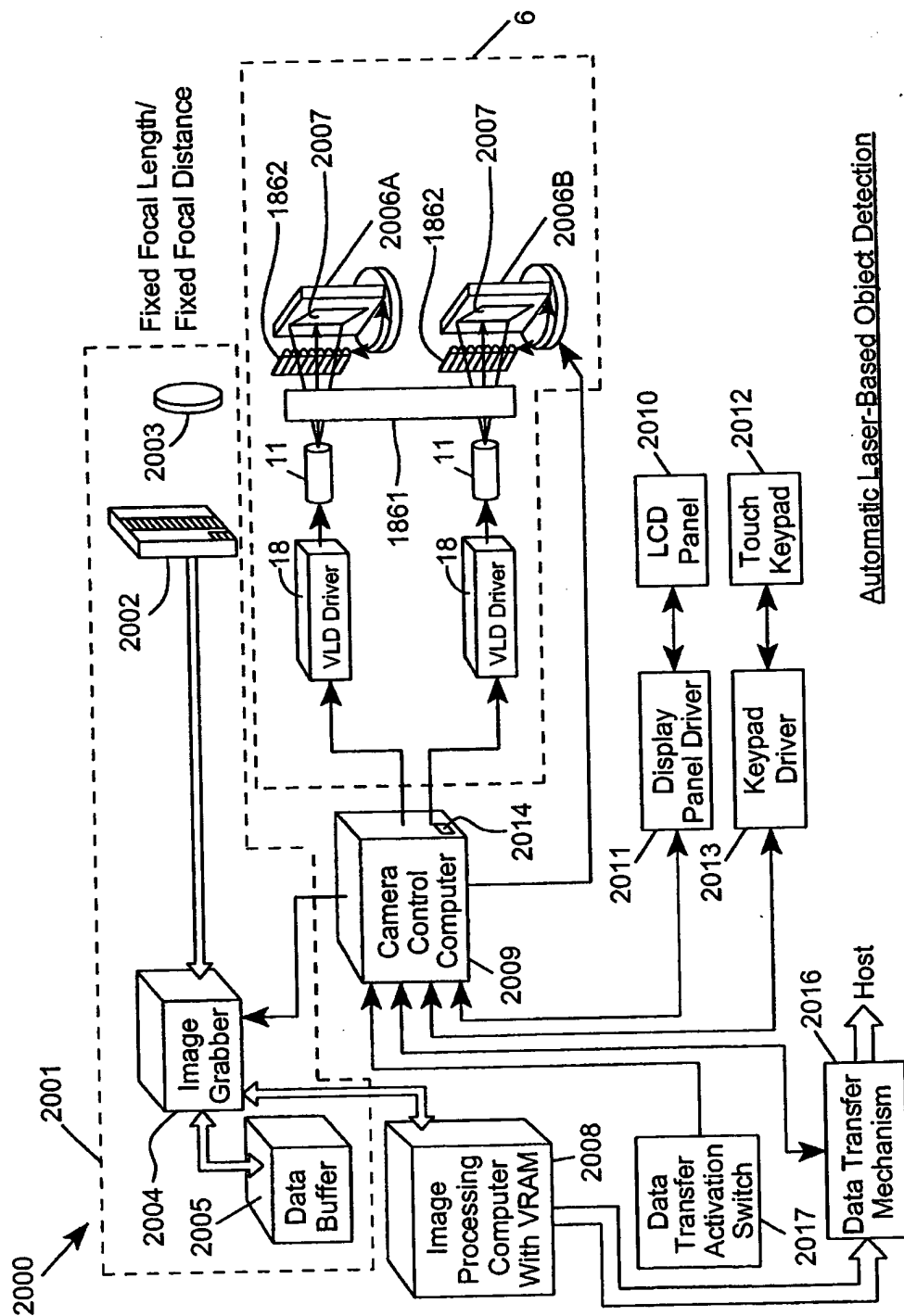


FIG. 53A3

Automatic Laser-Based Object Detection

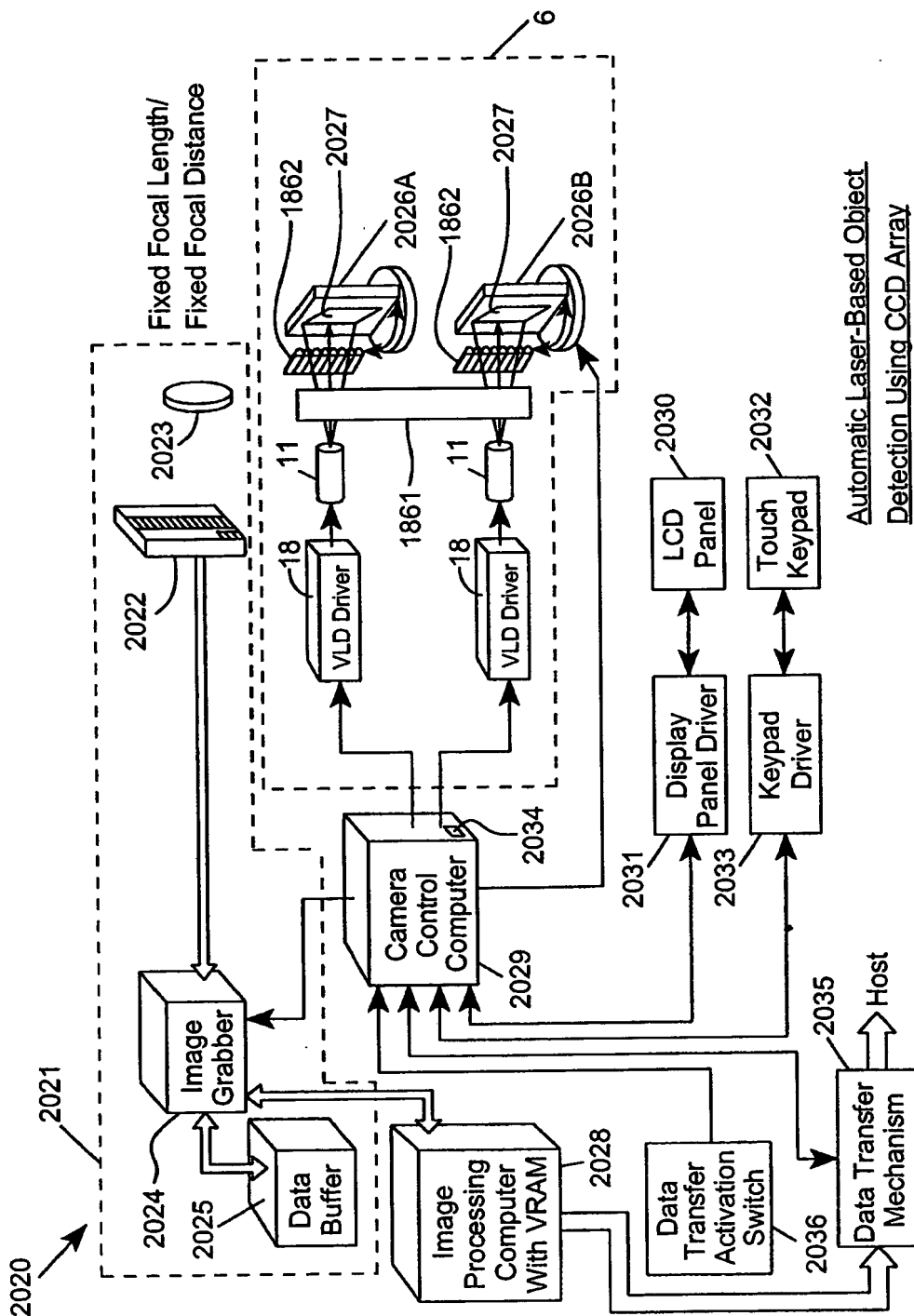


FIG. 53A4

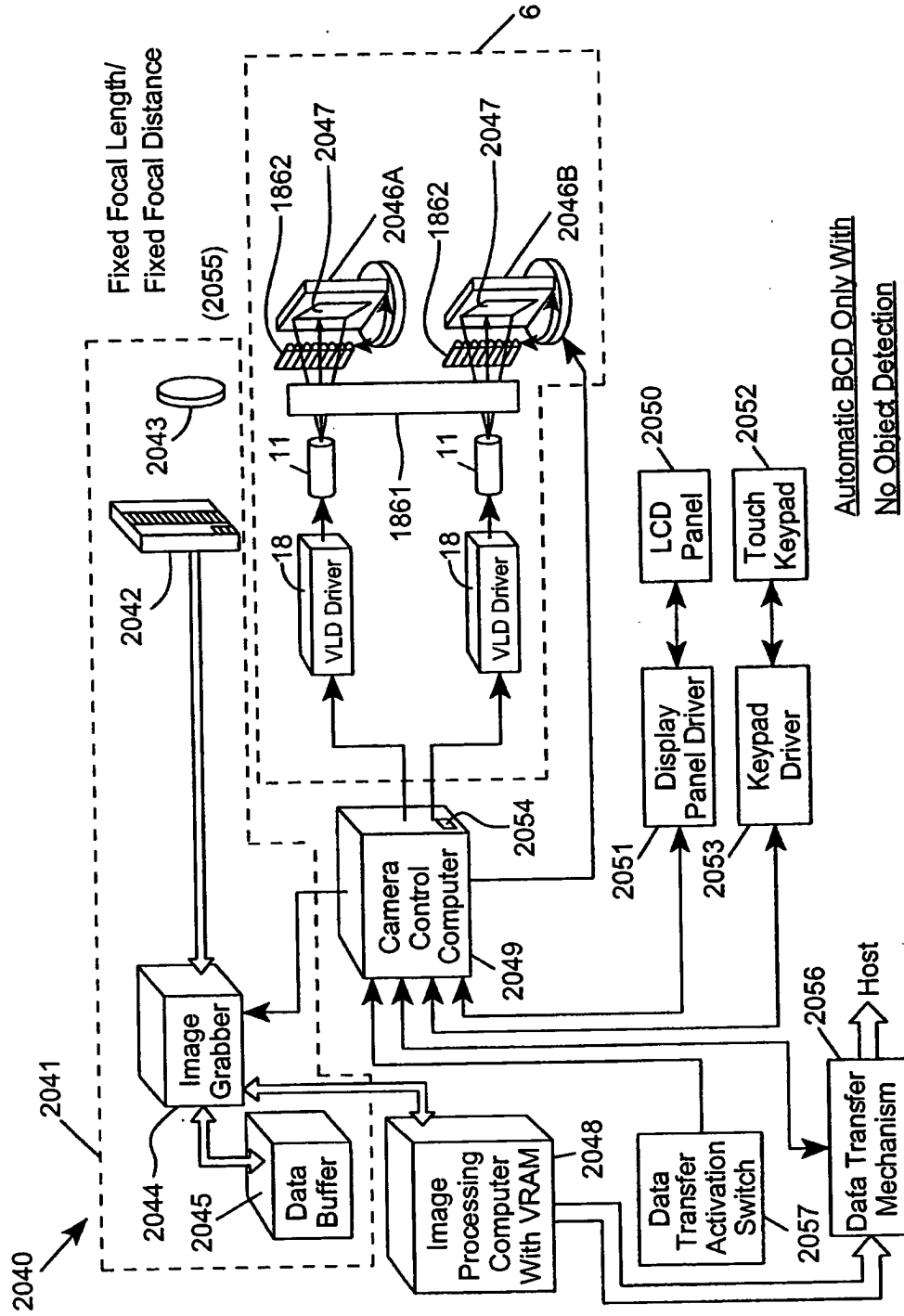
[illegible]

FIG. 53A5

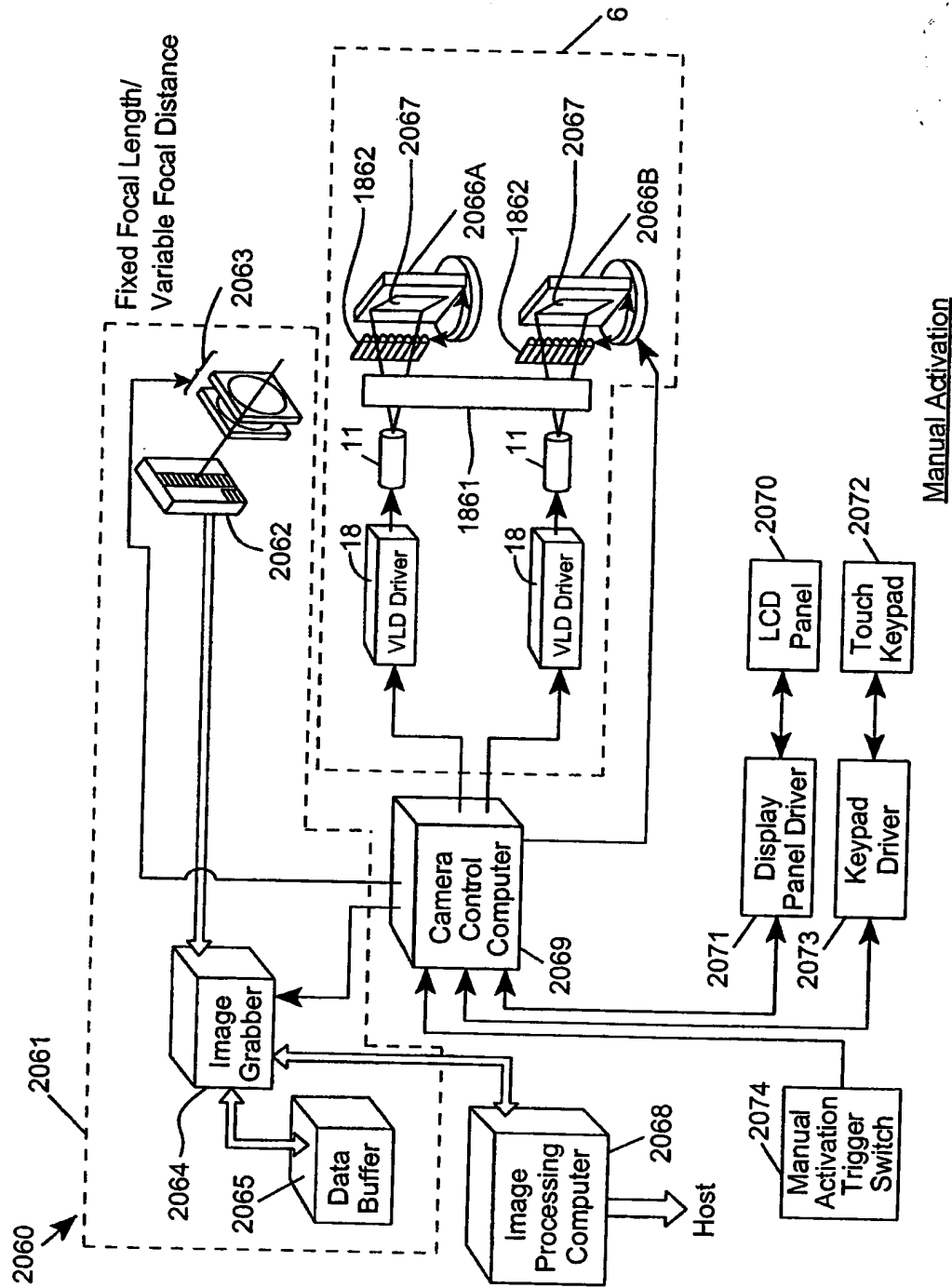
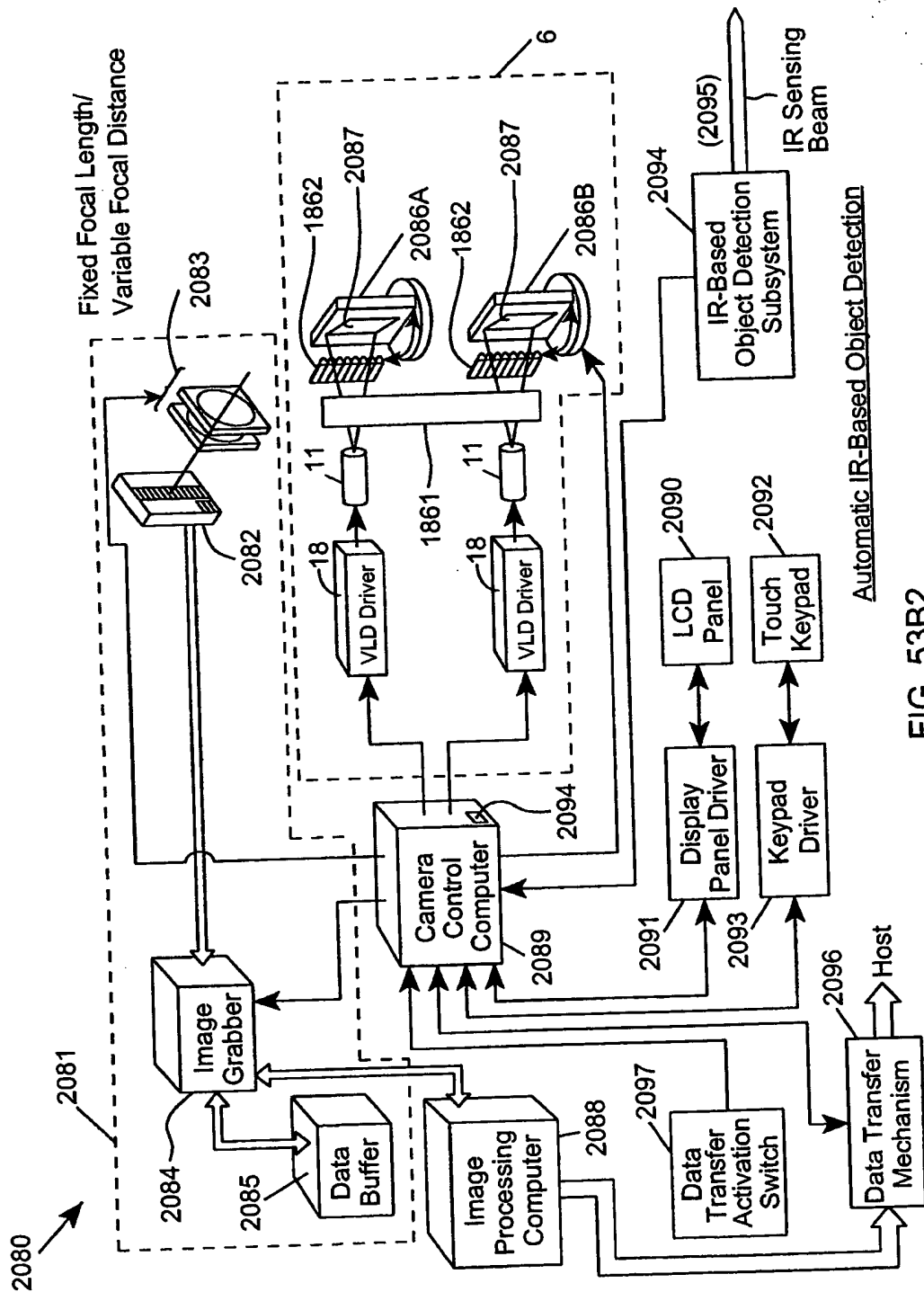
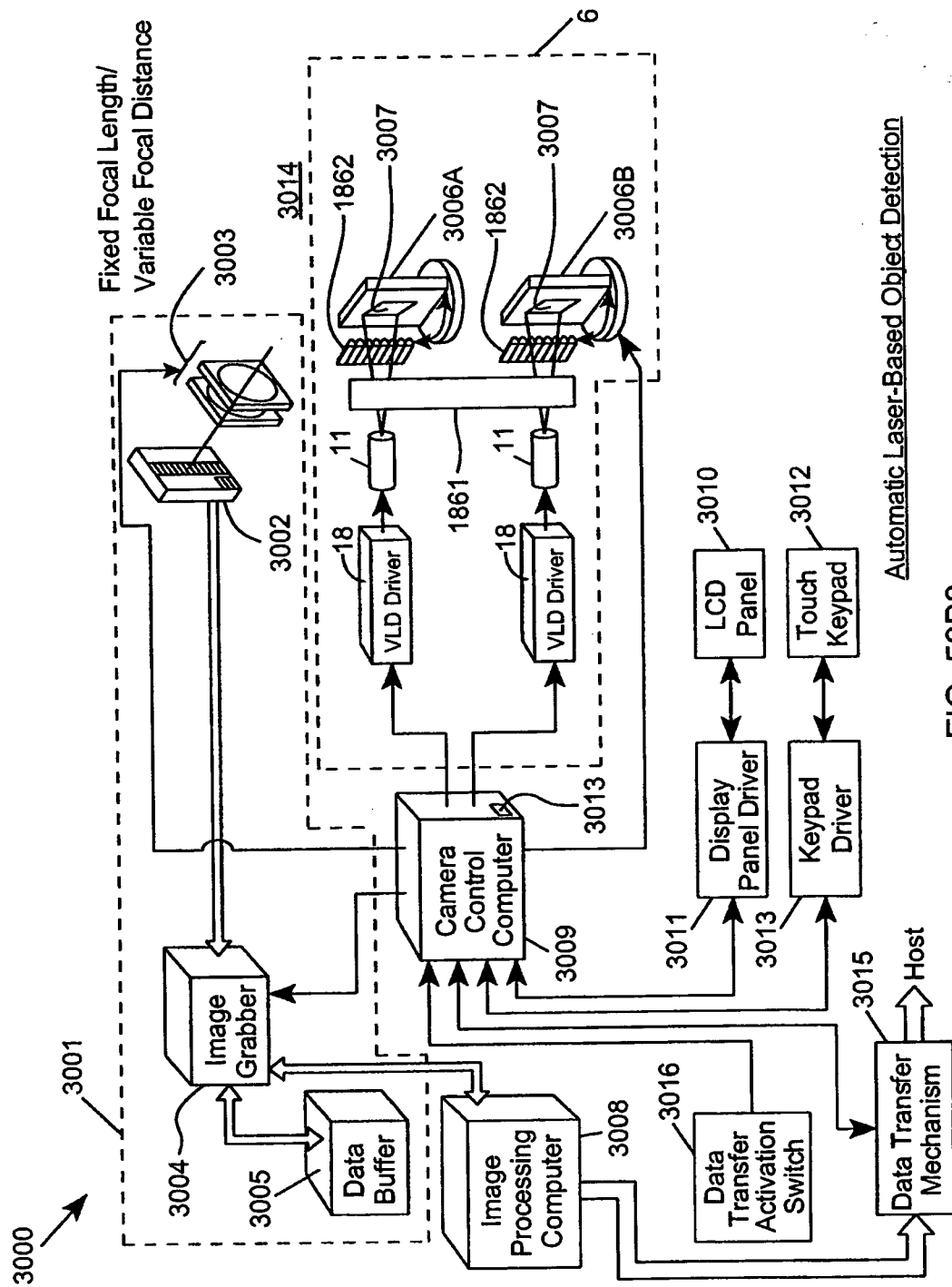


FIG. 53B1

Manual Activation





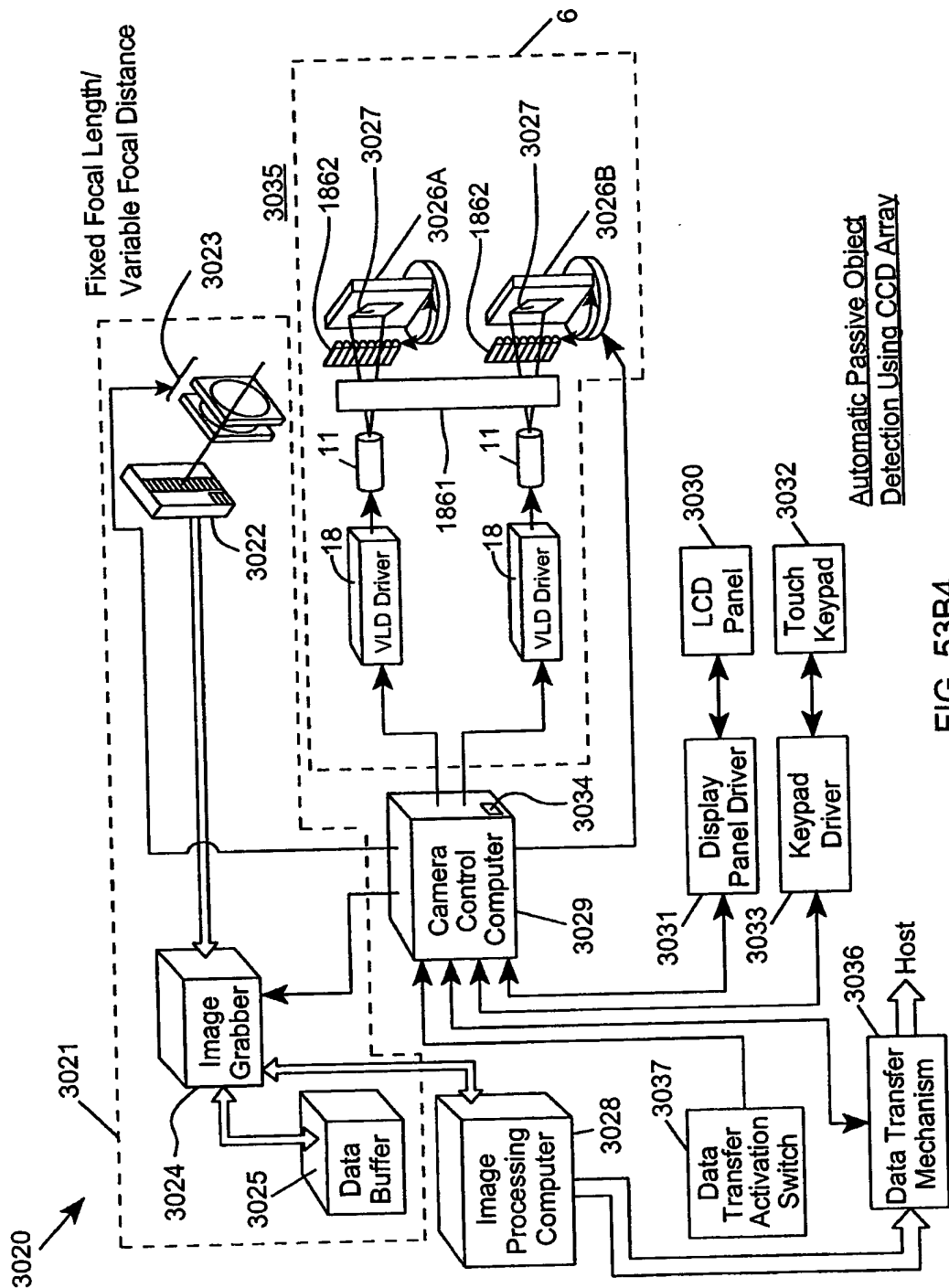
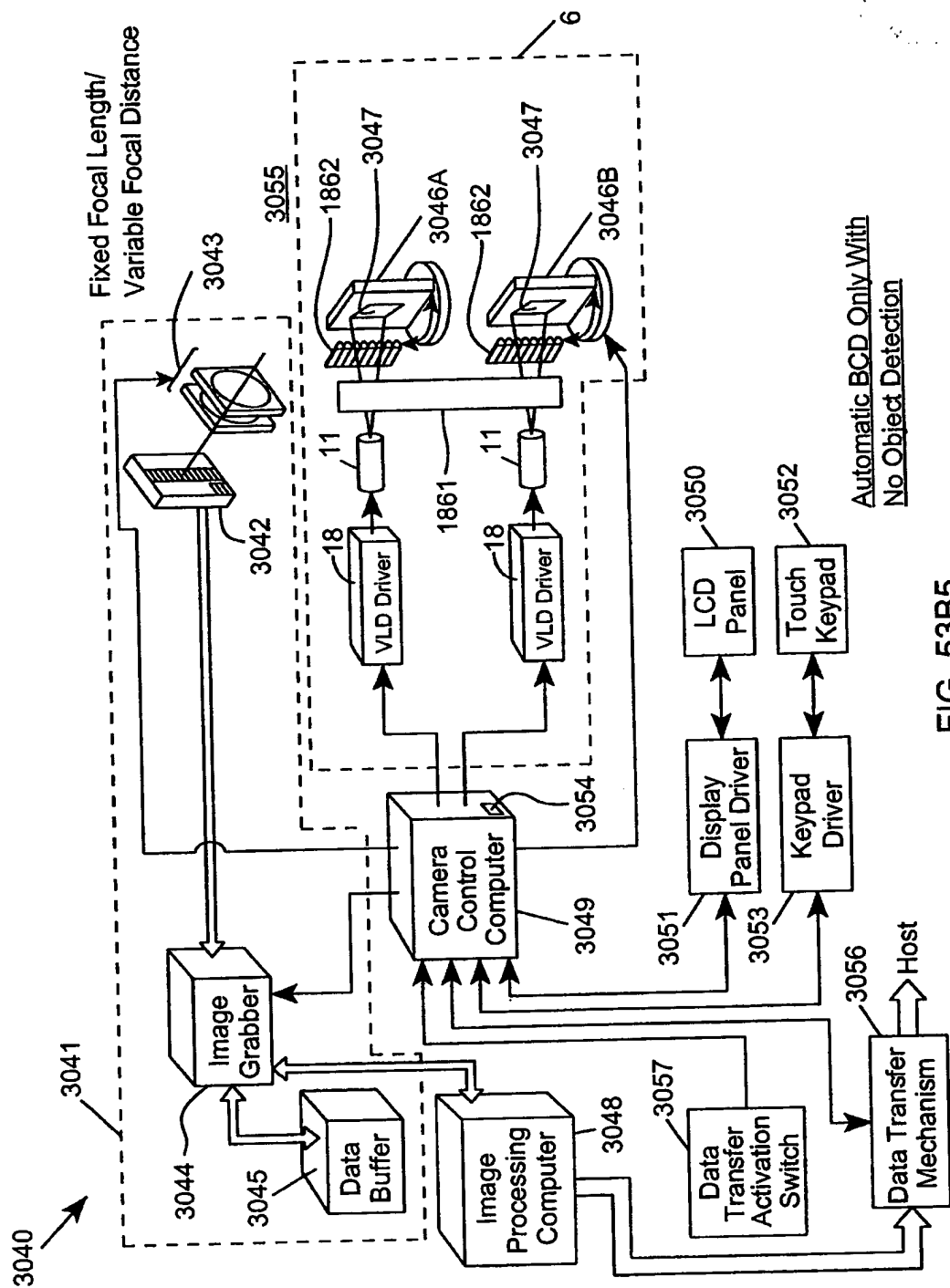
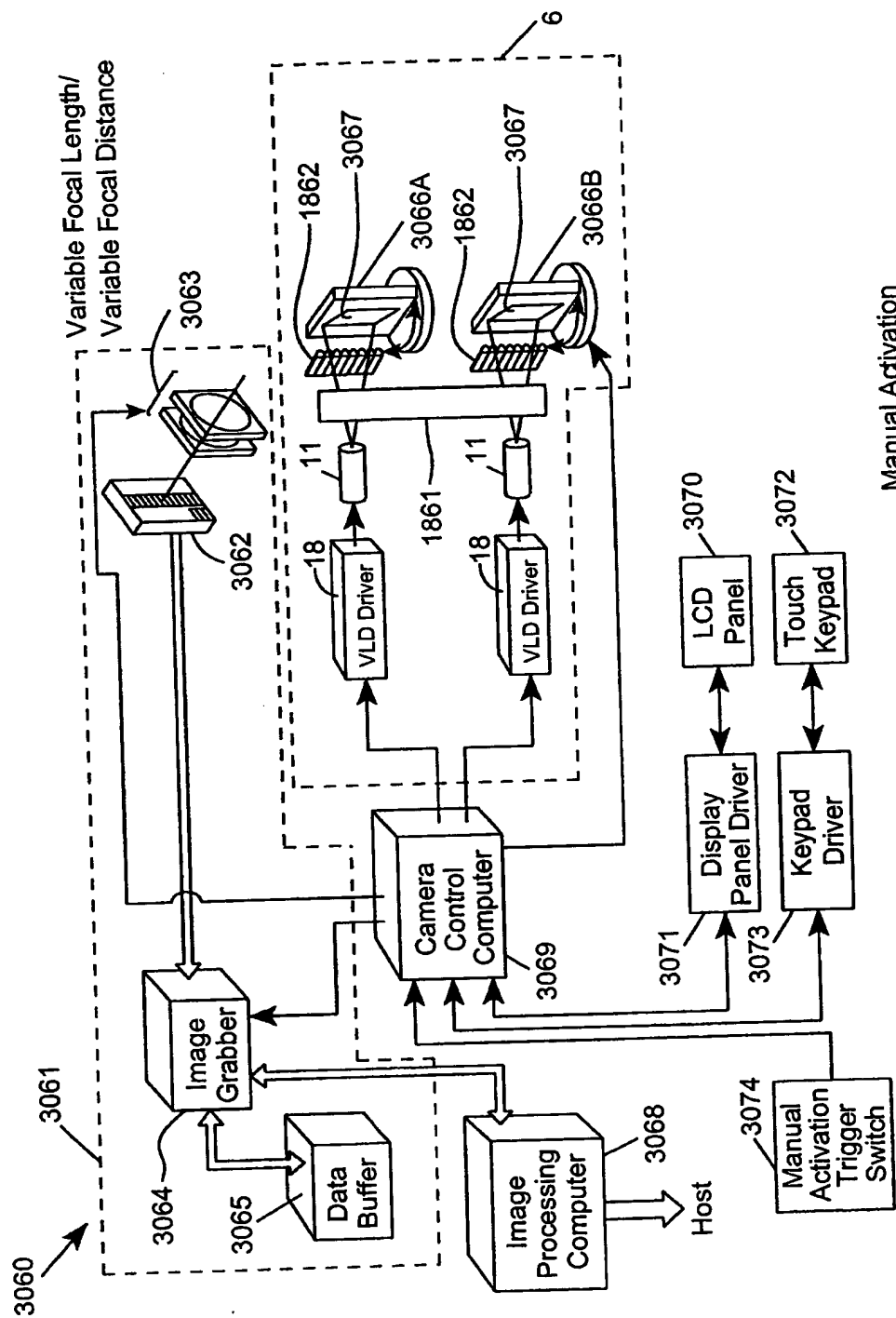
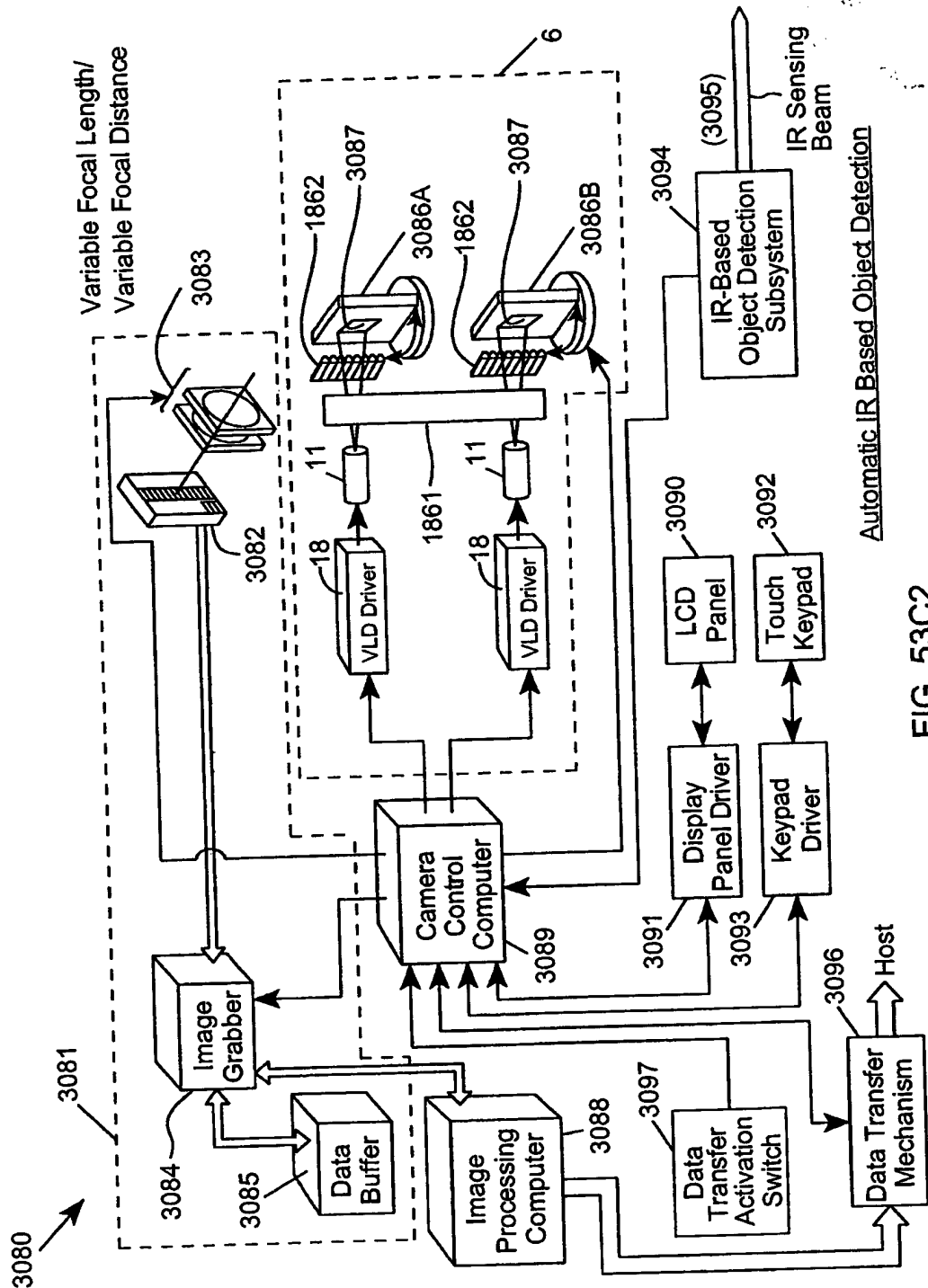
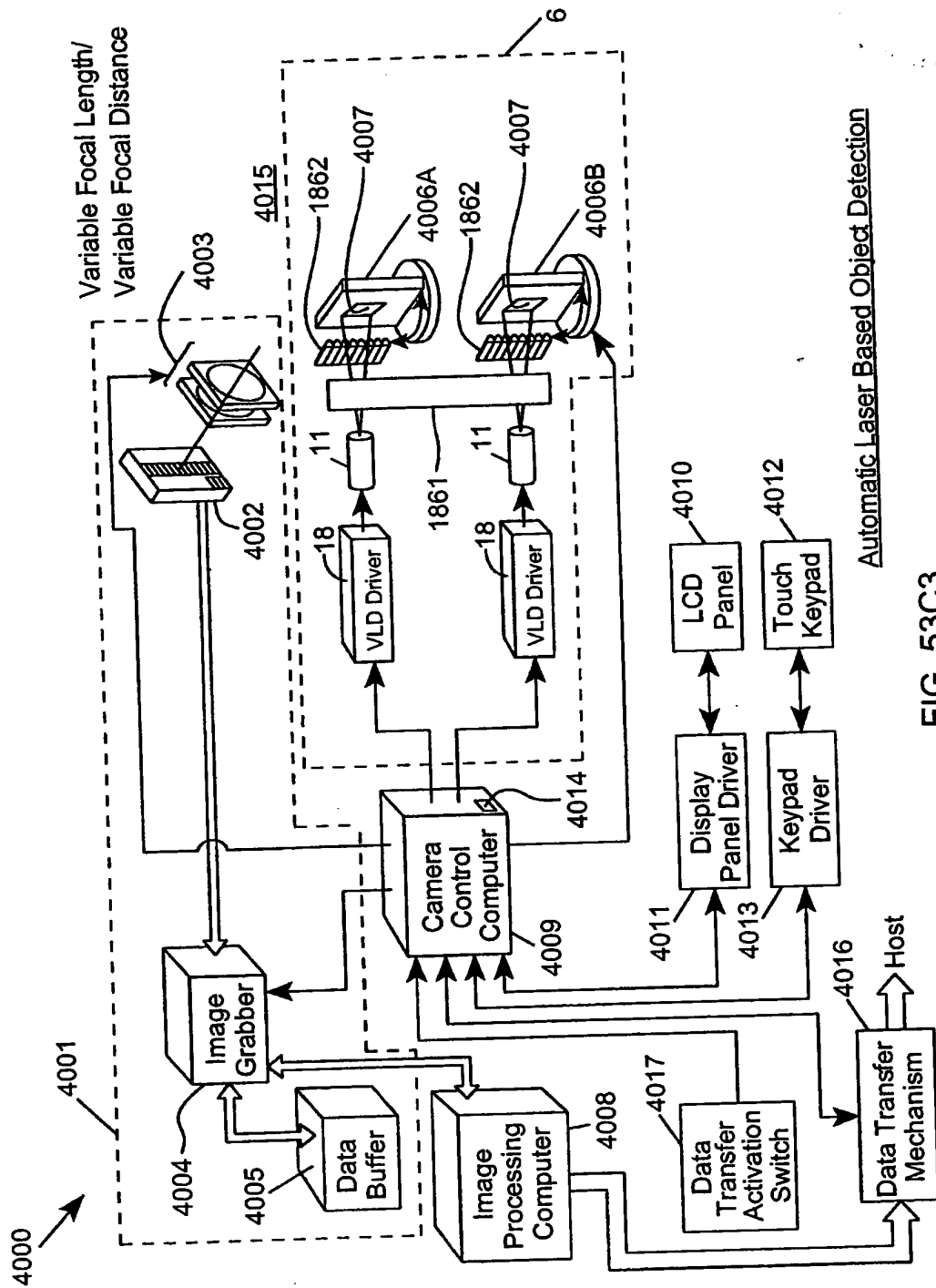


FIG. 53B4



[illegible]





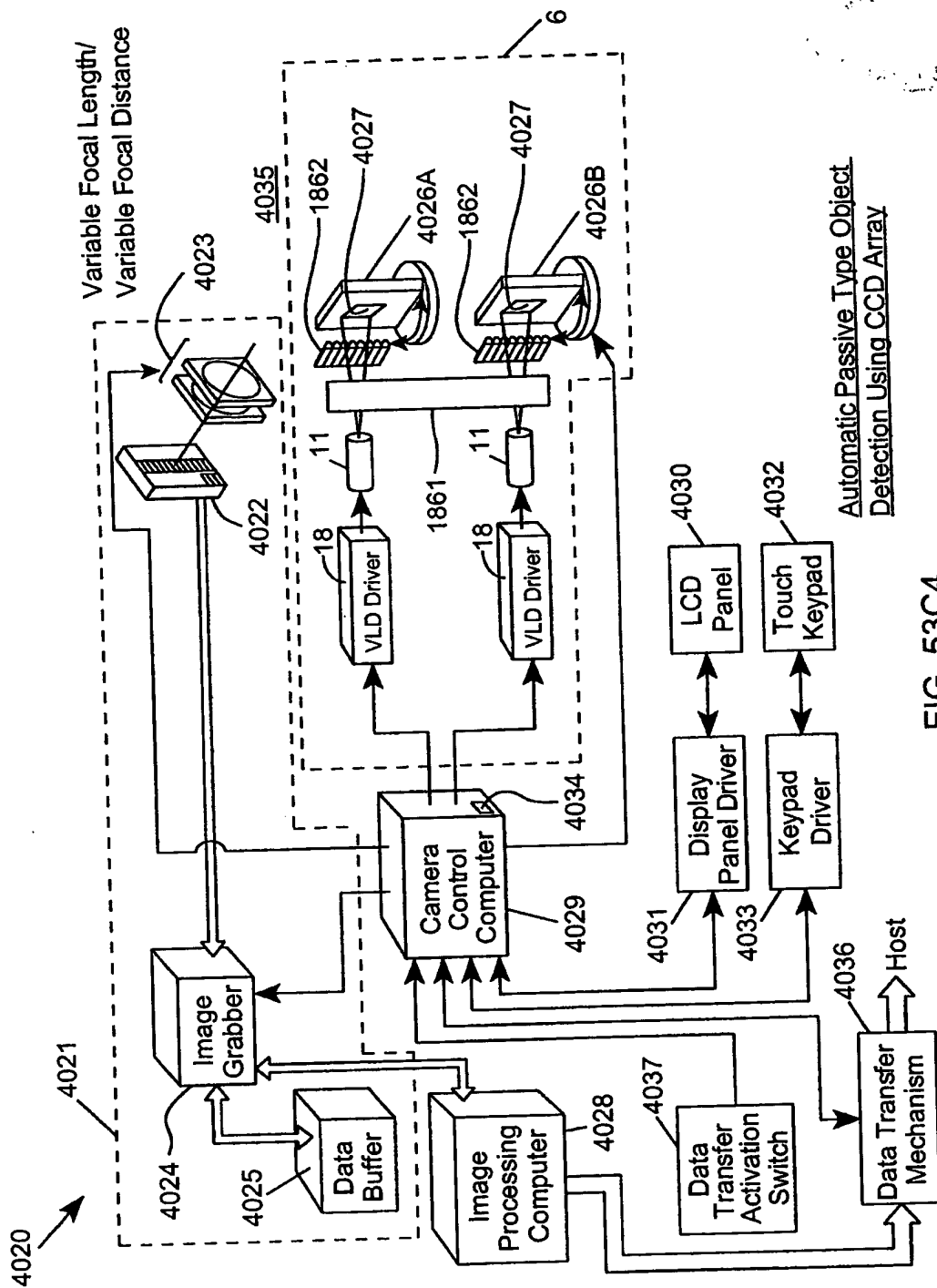


FIG. 53C4

Automatic Passive Type Object
Detection Using CCD Array

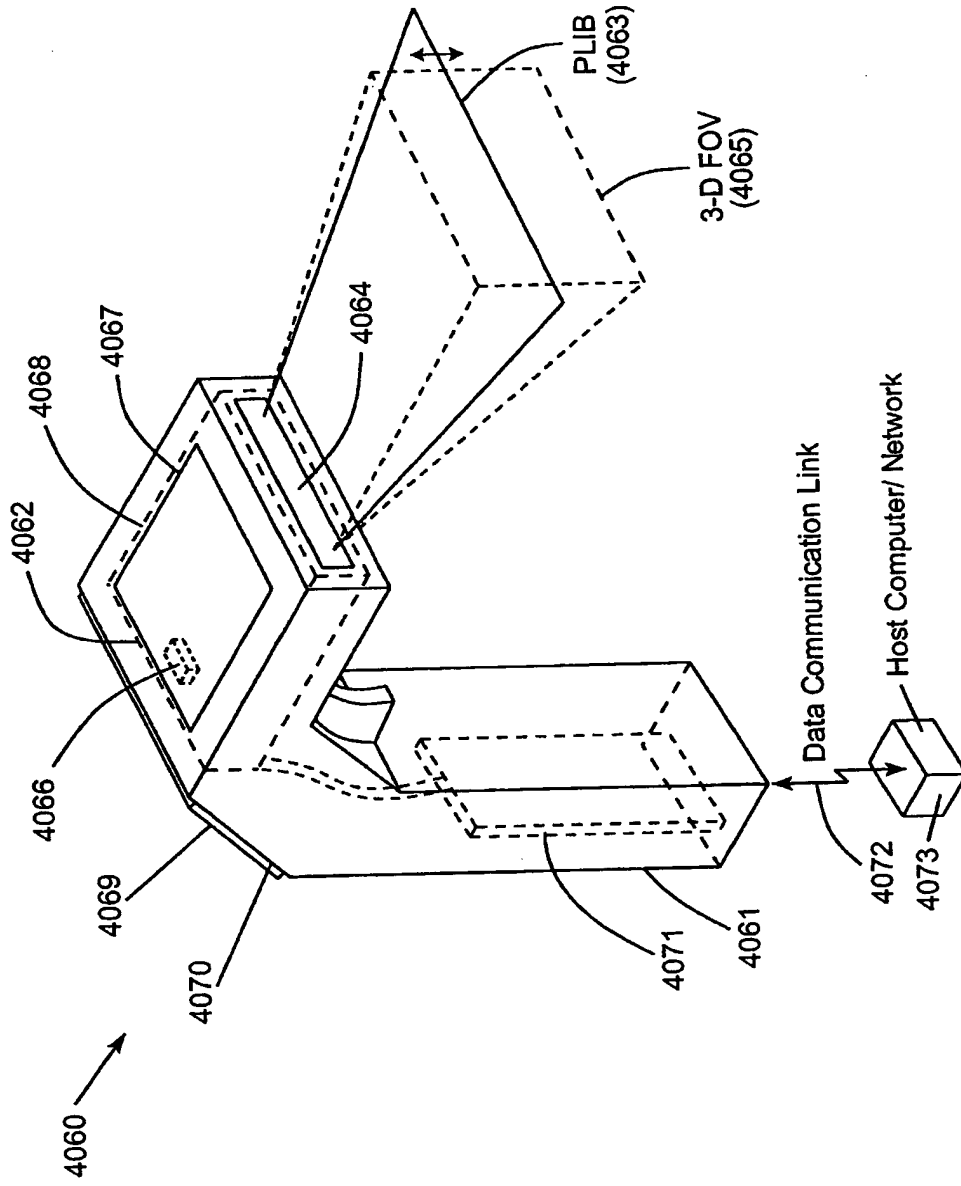
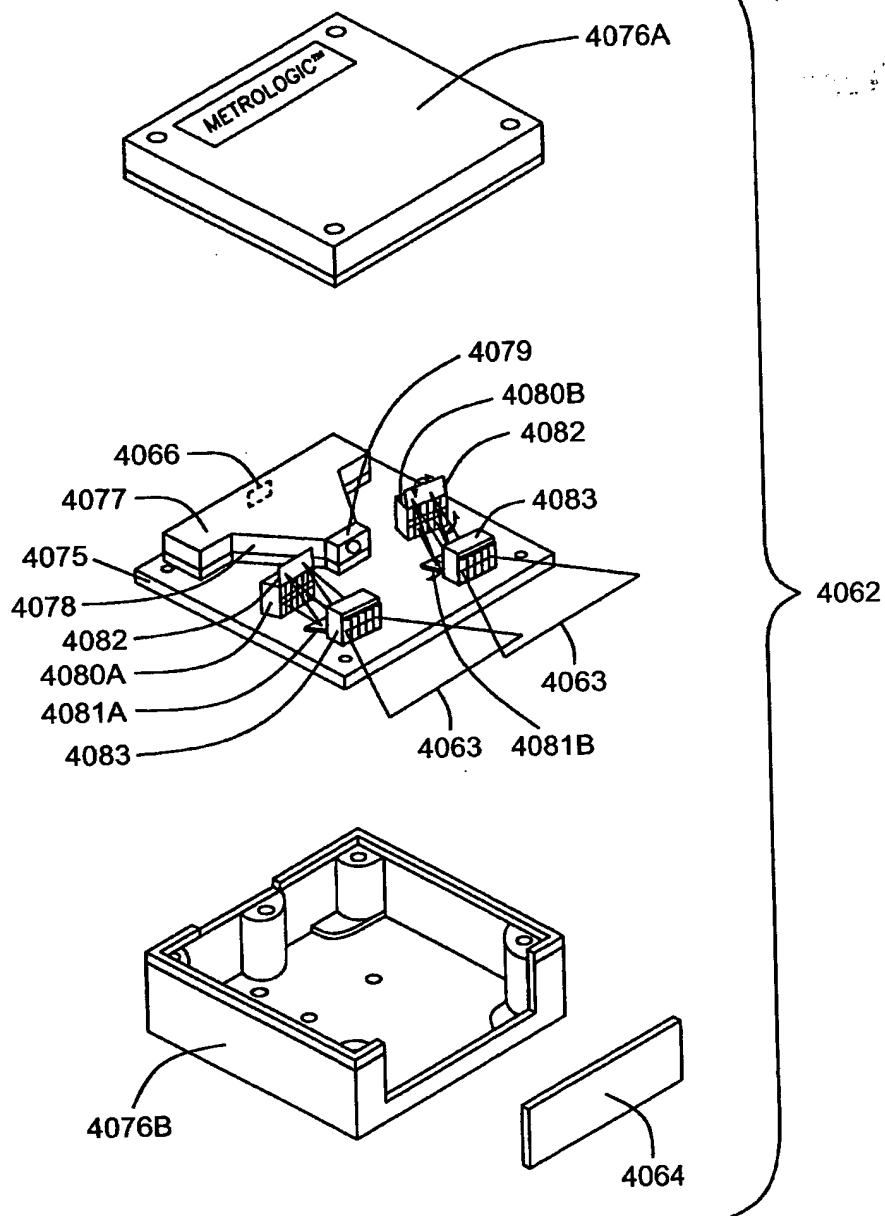


FIG. 54A

20060207 04523004



(Dual Mirrors)
Fig. 115A-5D

FIG. 54B

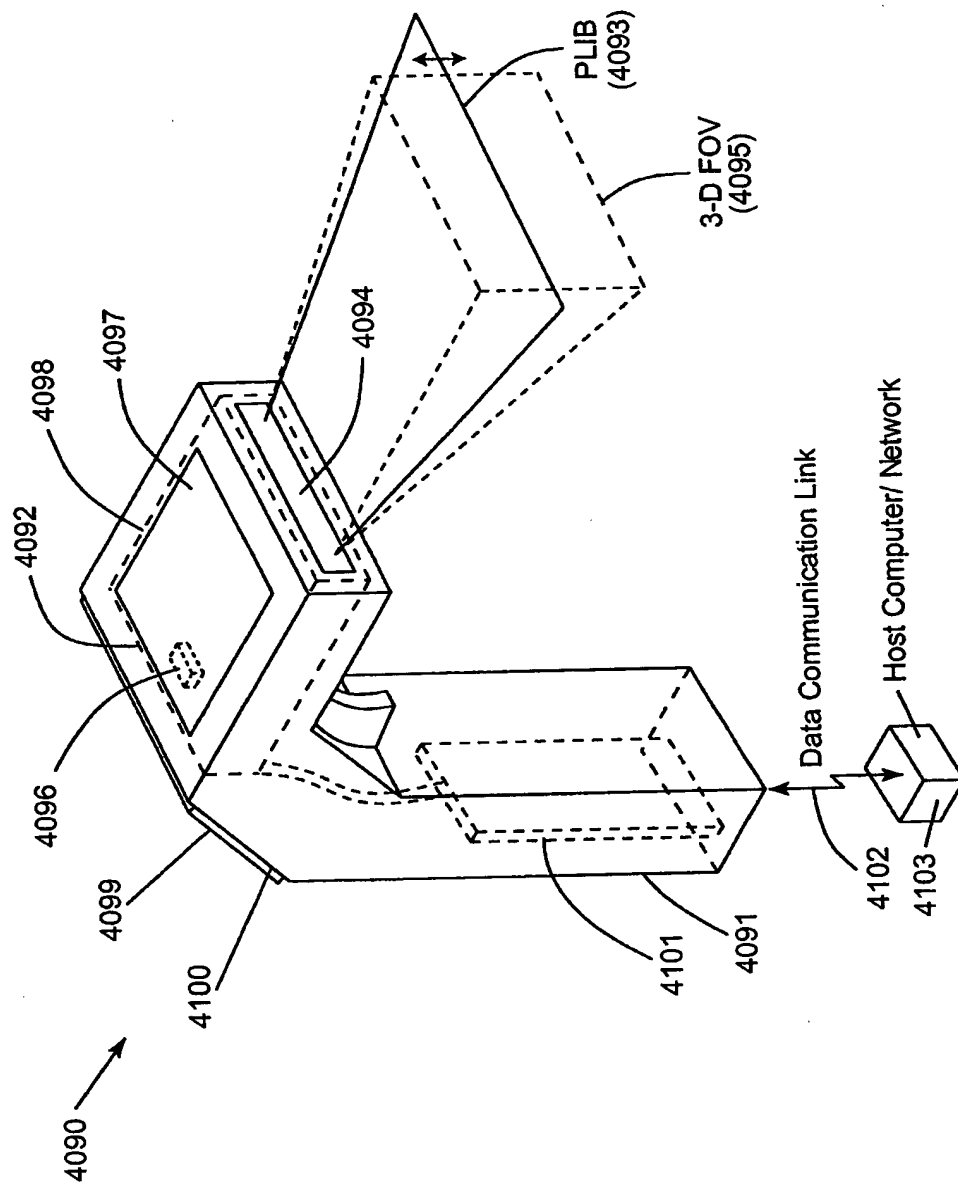
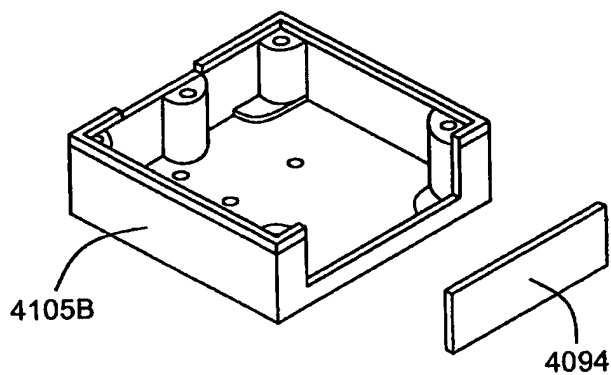
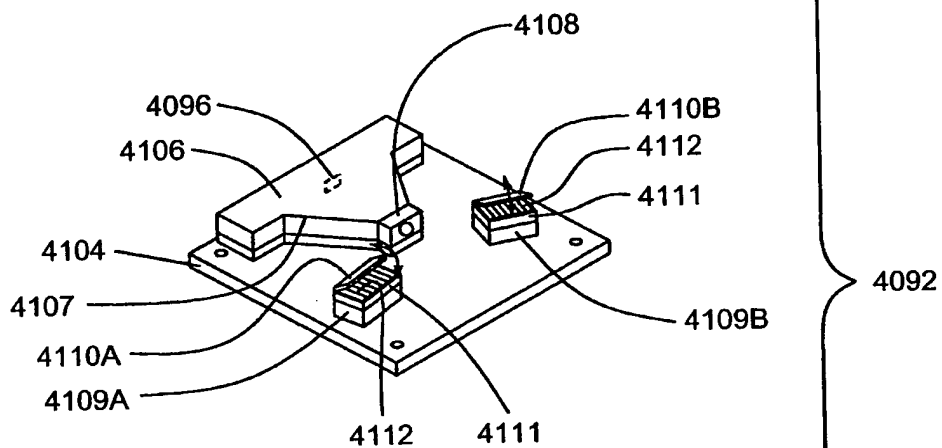
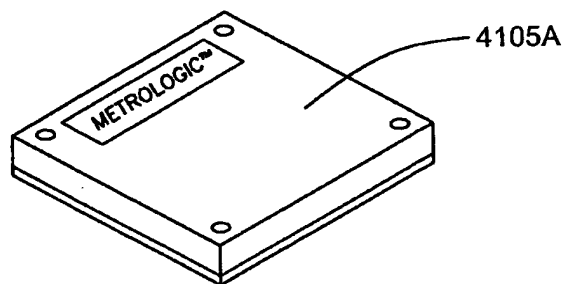


FIG. 55A



Bragg Cell
Fig. 116A-6B

FIG. 55B

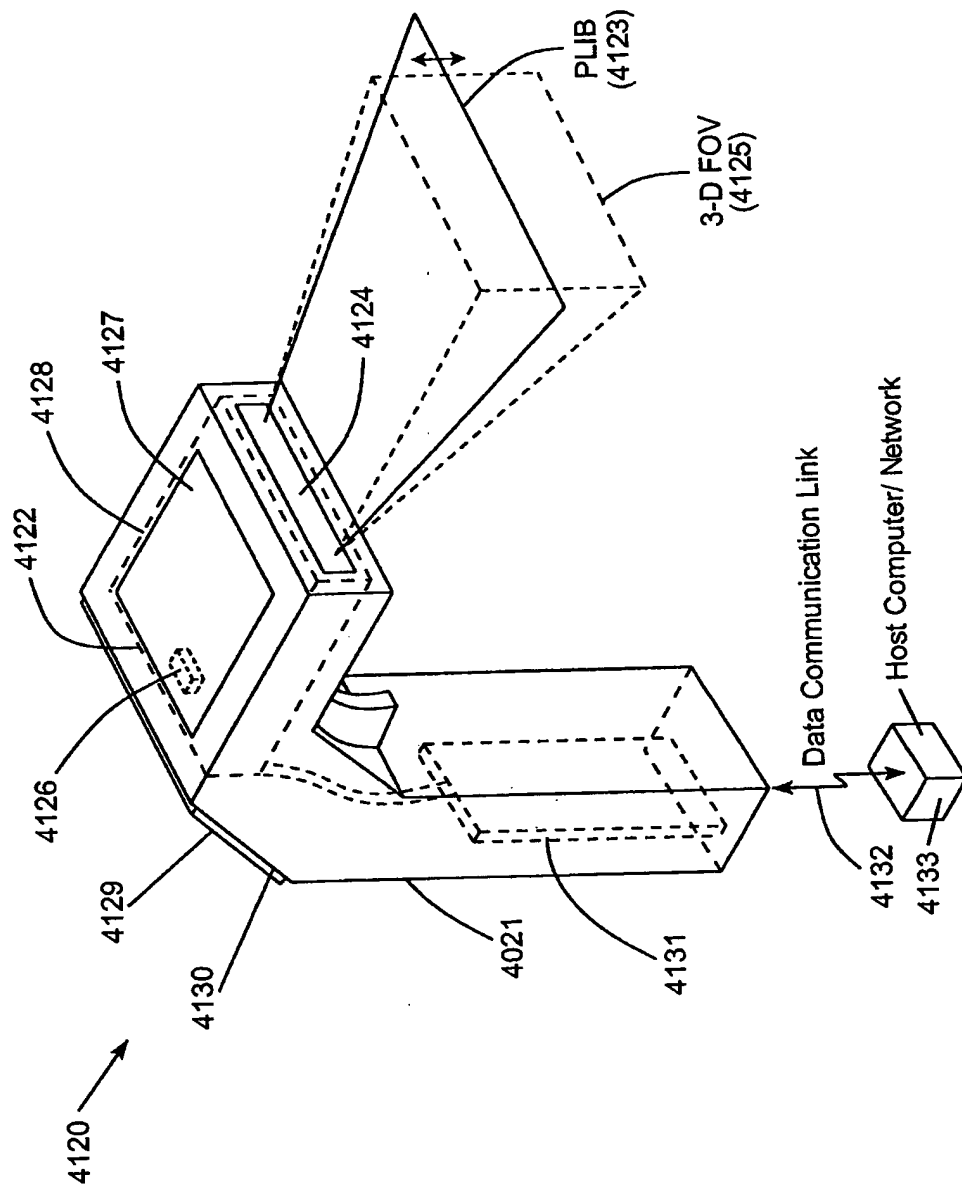
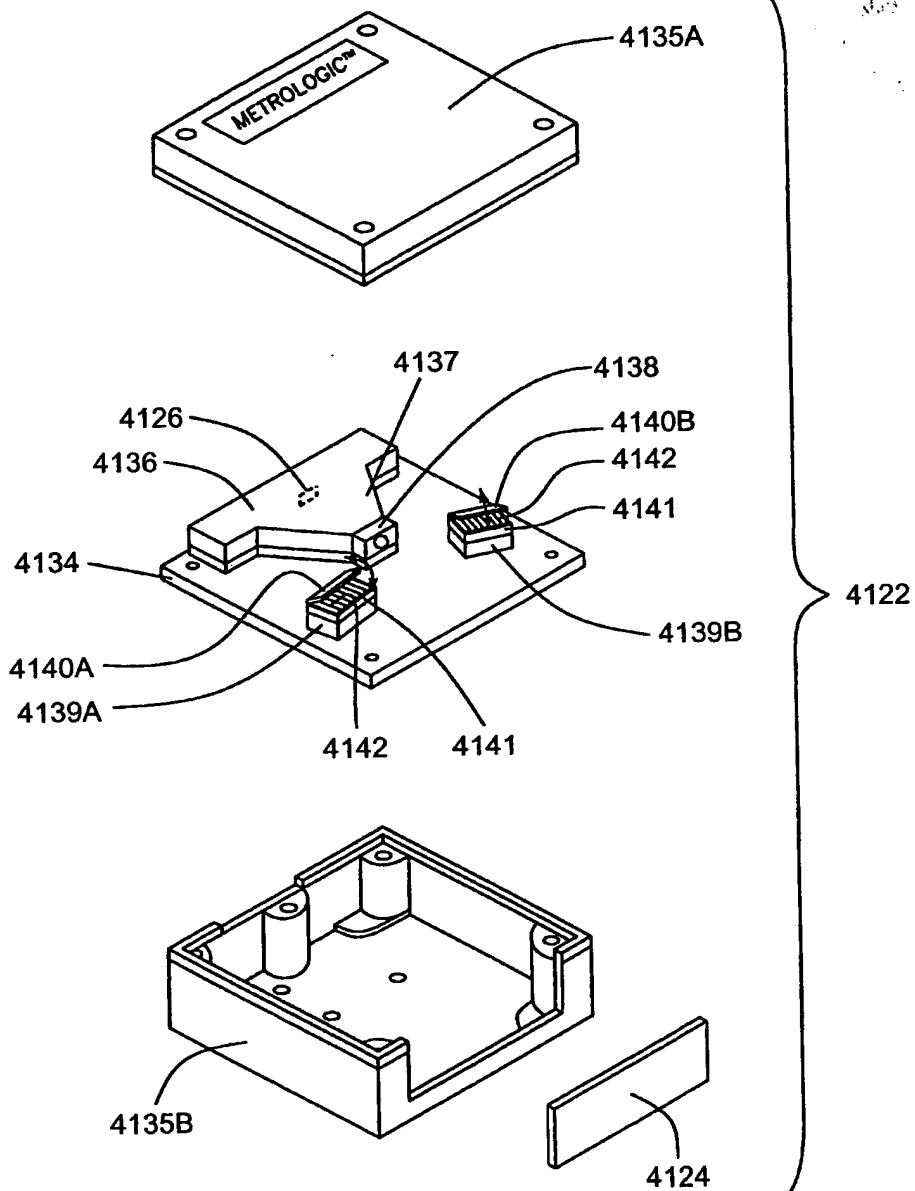


FIG. 56A

20060207 04523004



DM
Fig. 117A-7B

FIG. 56B

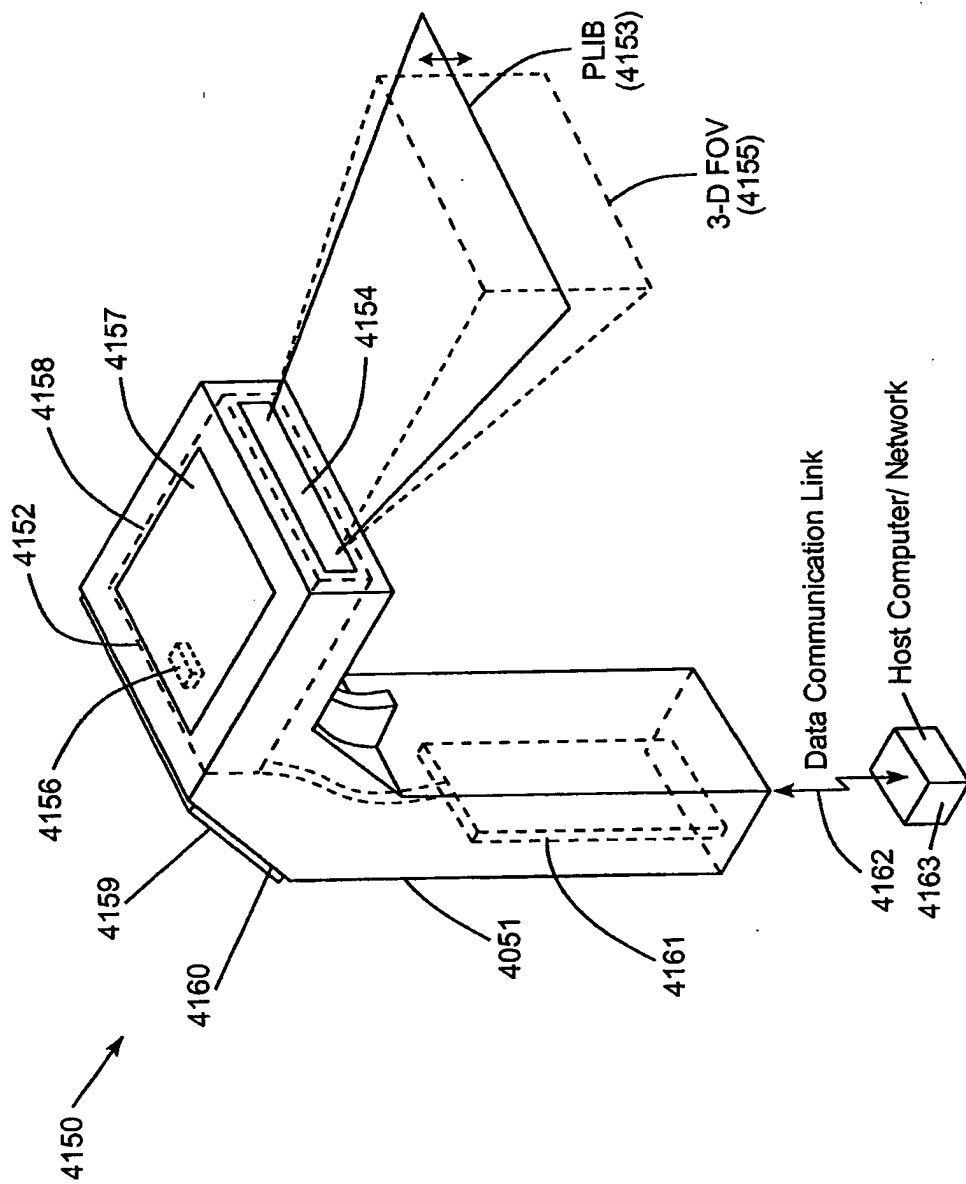
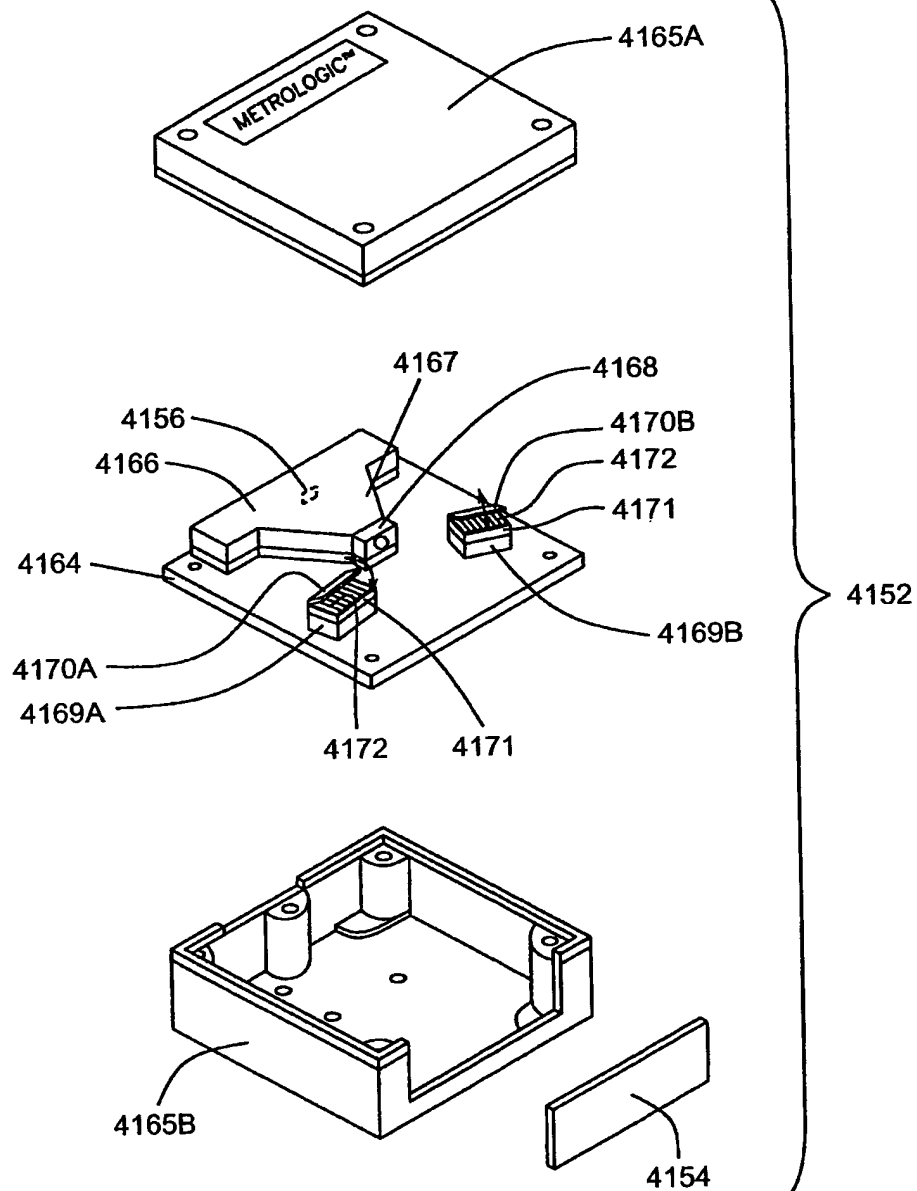


FIG. 57A

206020" 074525004



Phase Only LCD
PM Panel
Fig. 118F-8G

FIG. 57B

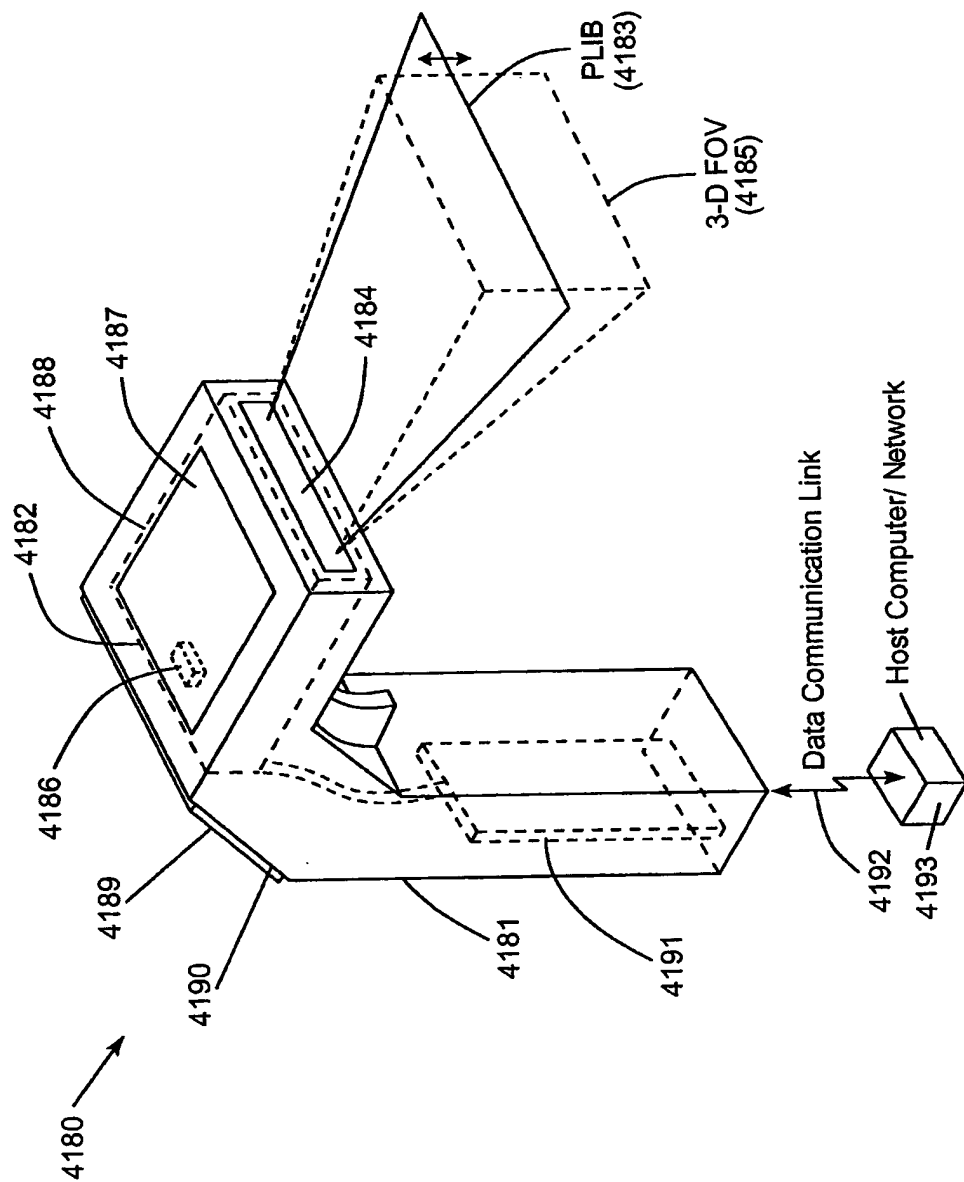
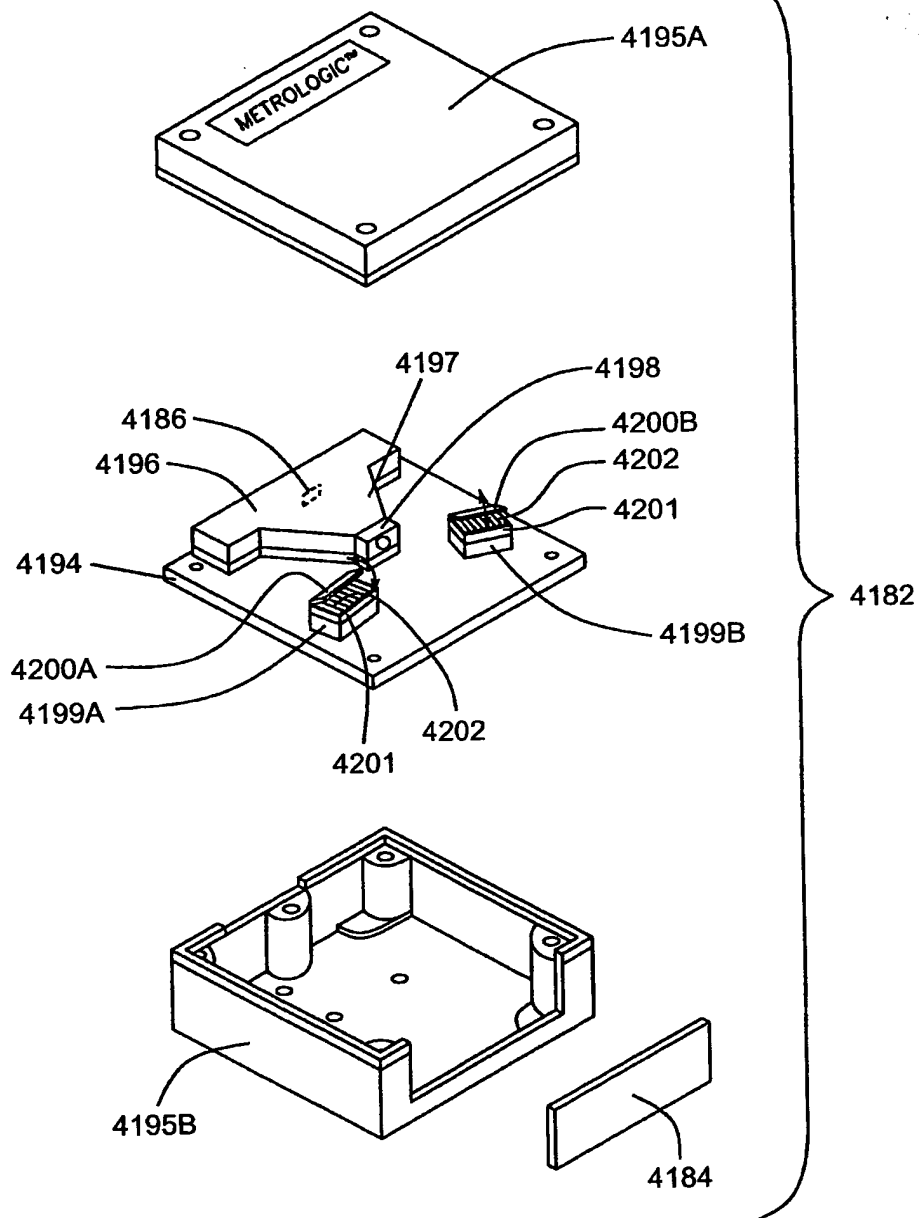


FIG. 58A

20060207 0452900T



HS Optical Shutter
Fig. 1114A-14B

FIG. 58B

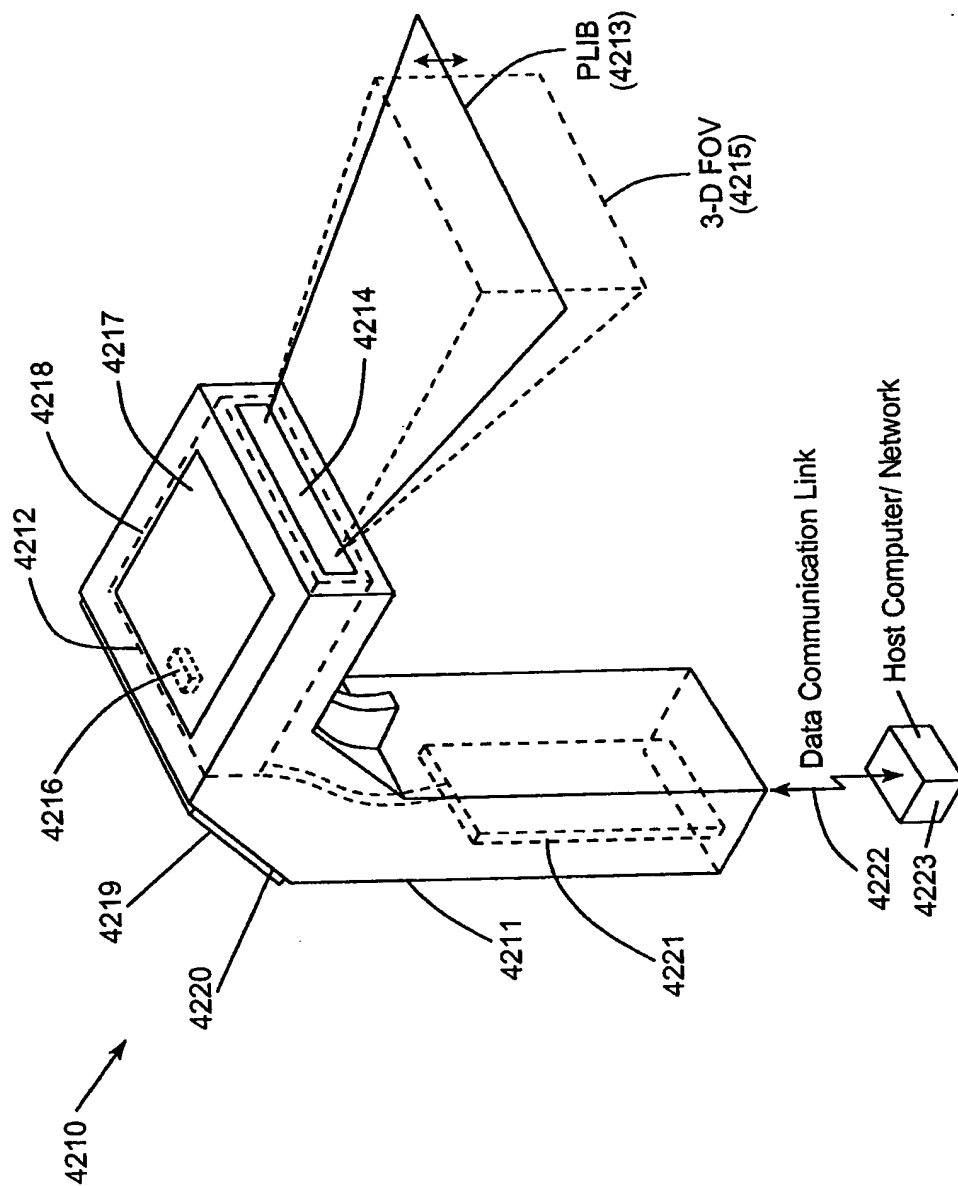
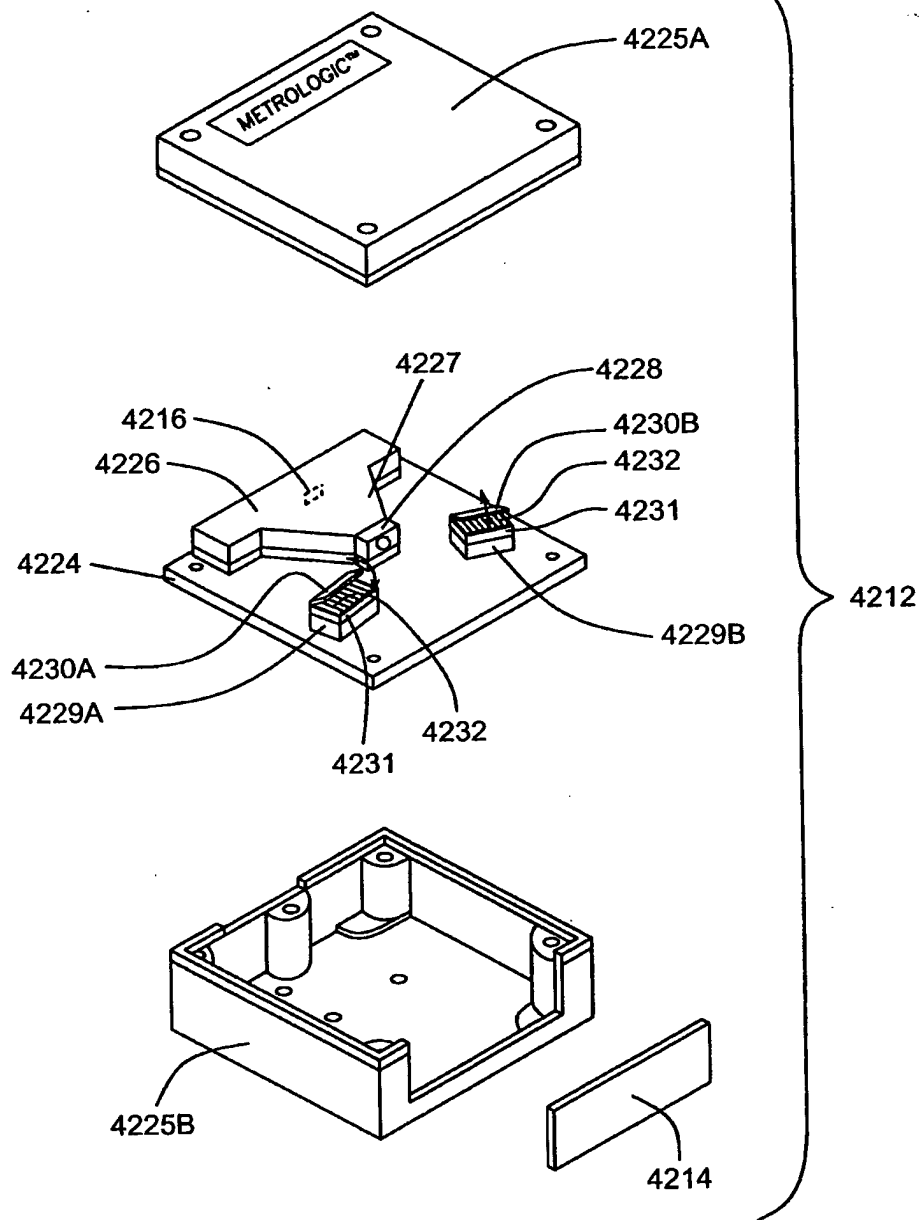


FIG. 59A

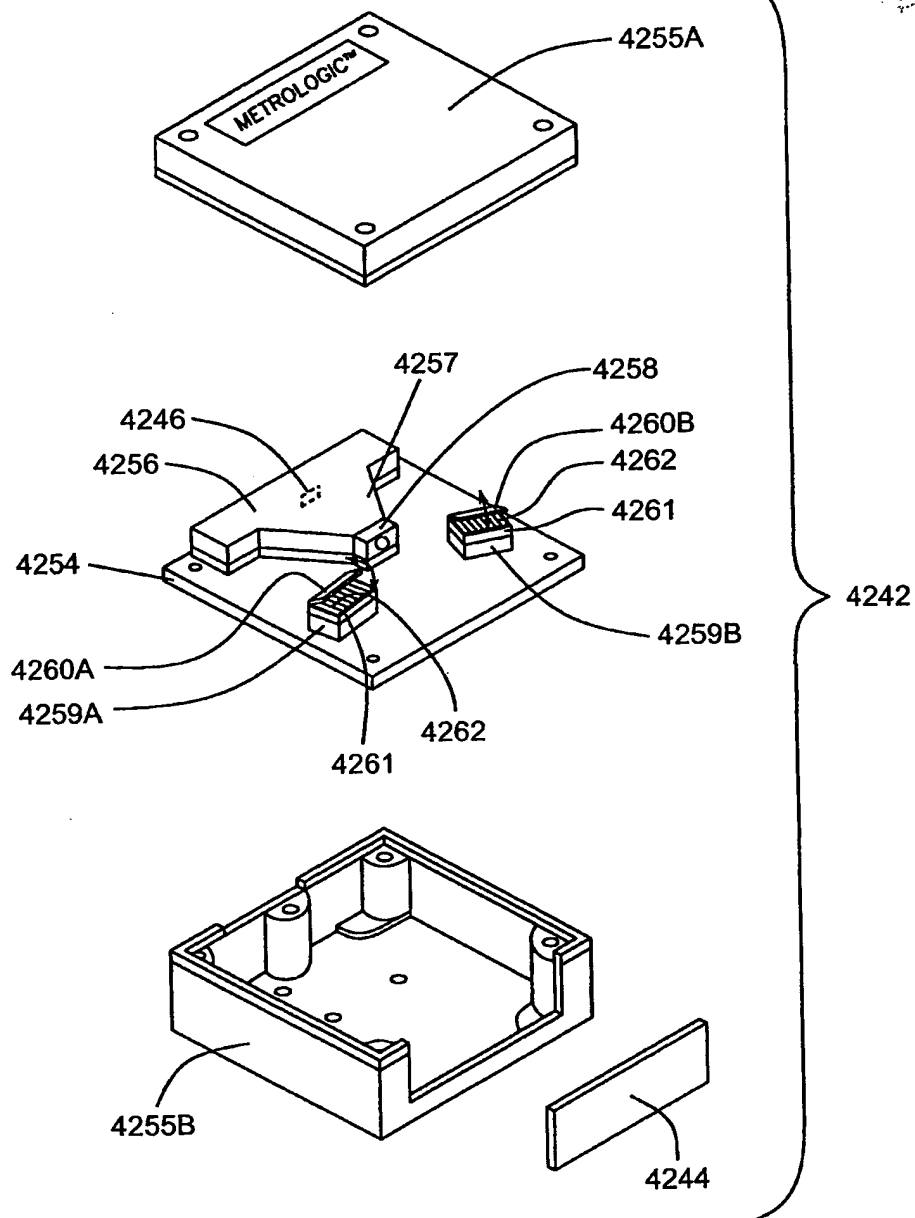
206020 04529001



MLLD
Fig. 1115A-15B

FIG. 59B

206020-04529001



Etalon (Temp. Phase Mod.)

Fig. 1117A-17B

FIG. 60B

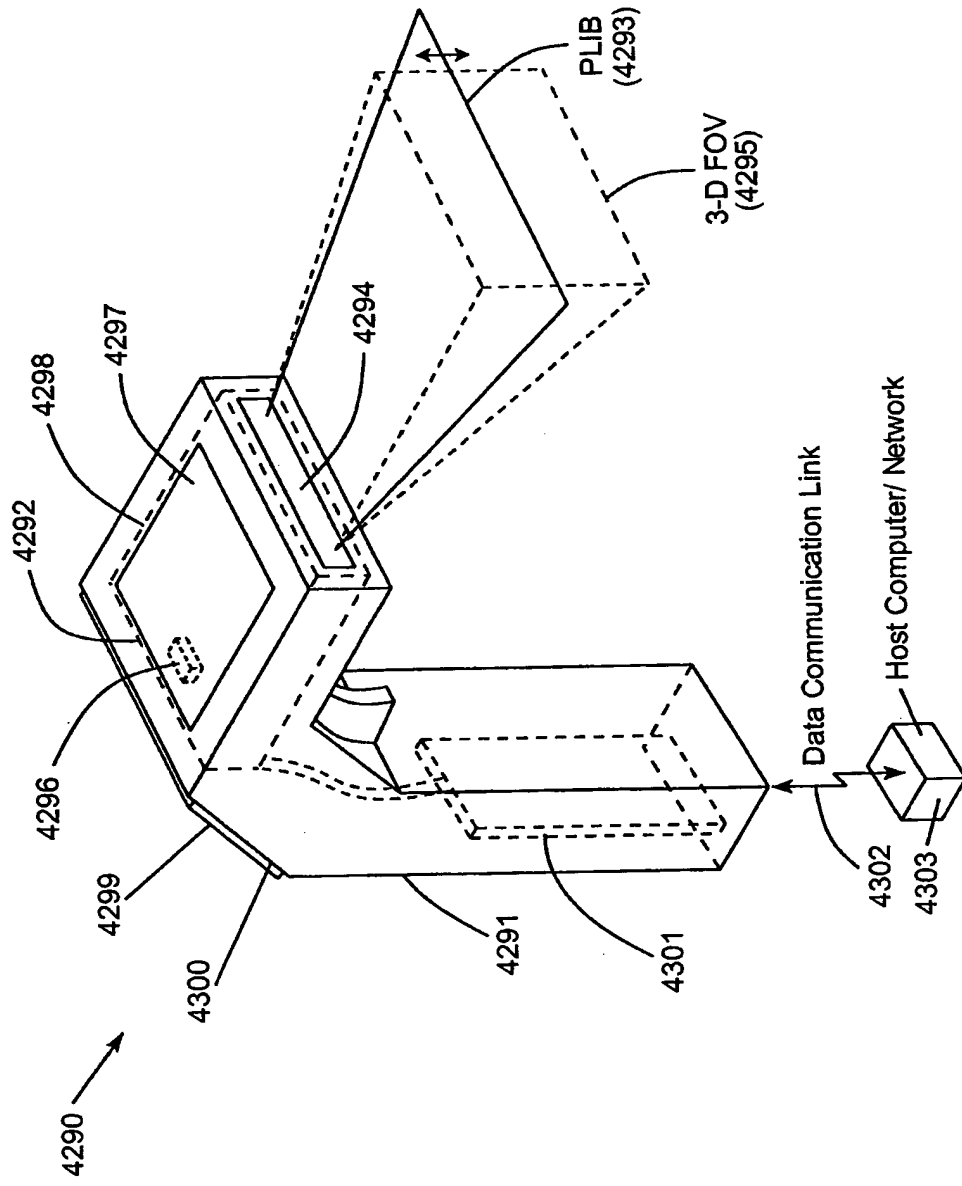
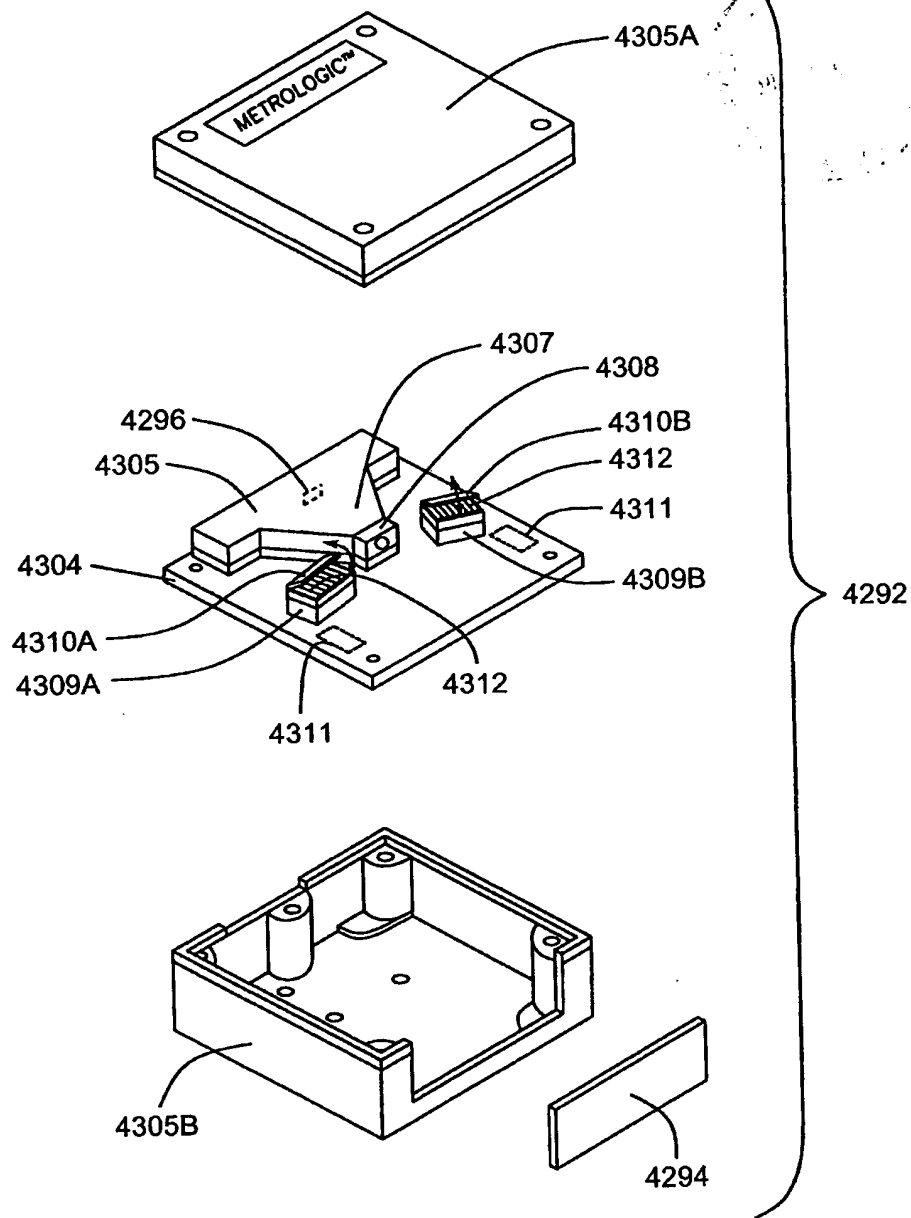


FIG. 61A

200001 04525001



Mode Hopping
Fig. 1119A-19B

FIG. 61B

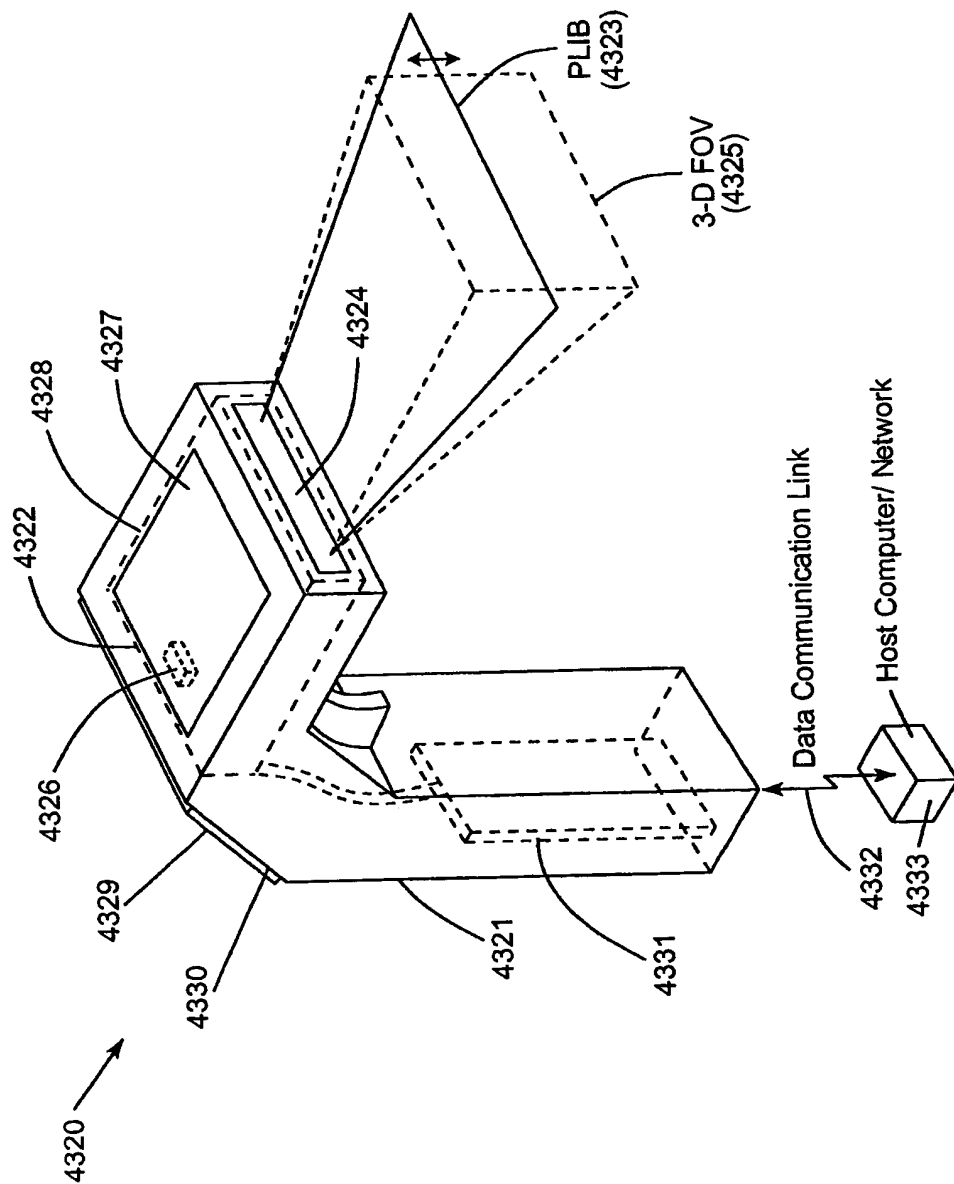
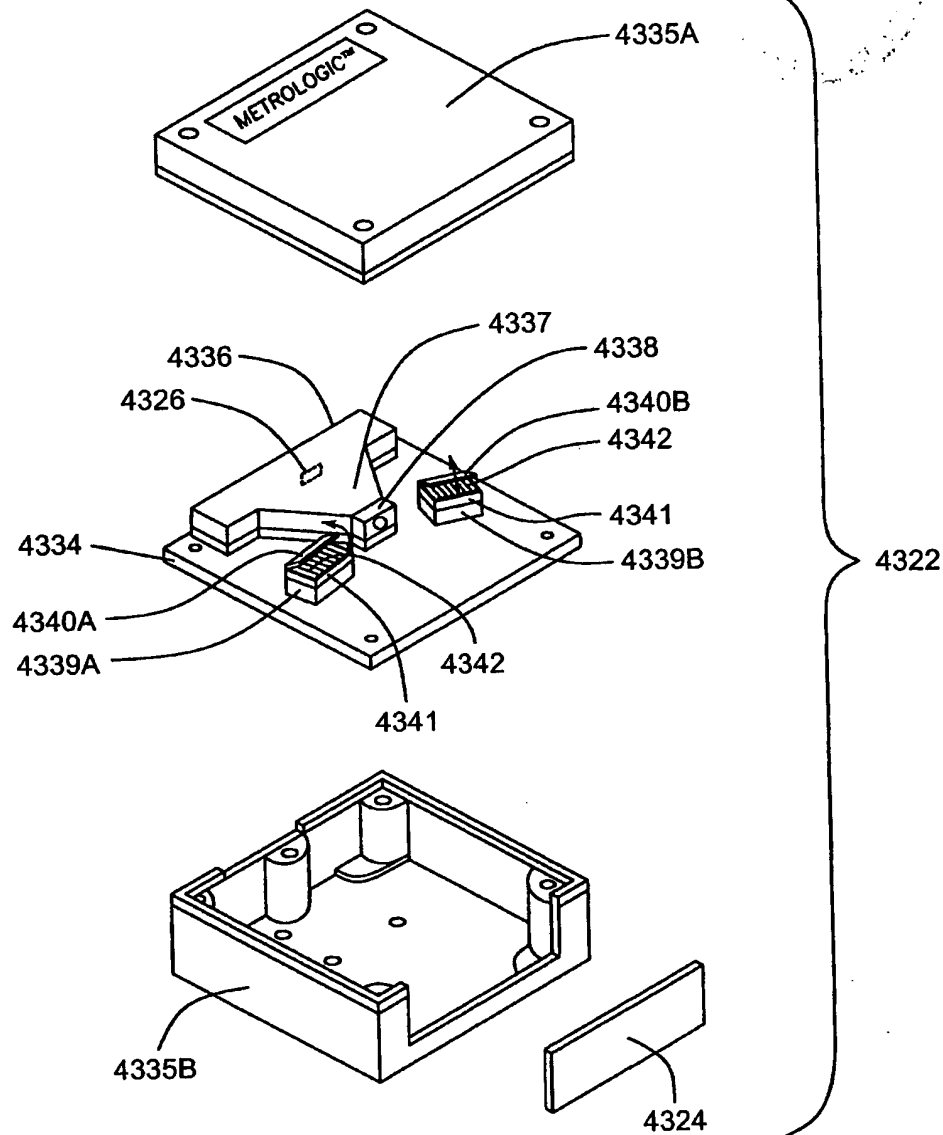


FIG. 62A

20000704929001



Micro-oscillating
Spatial Intensity
Modulation Panels
Fig. 1121A-21D

FIG. 62B

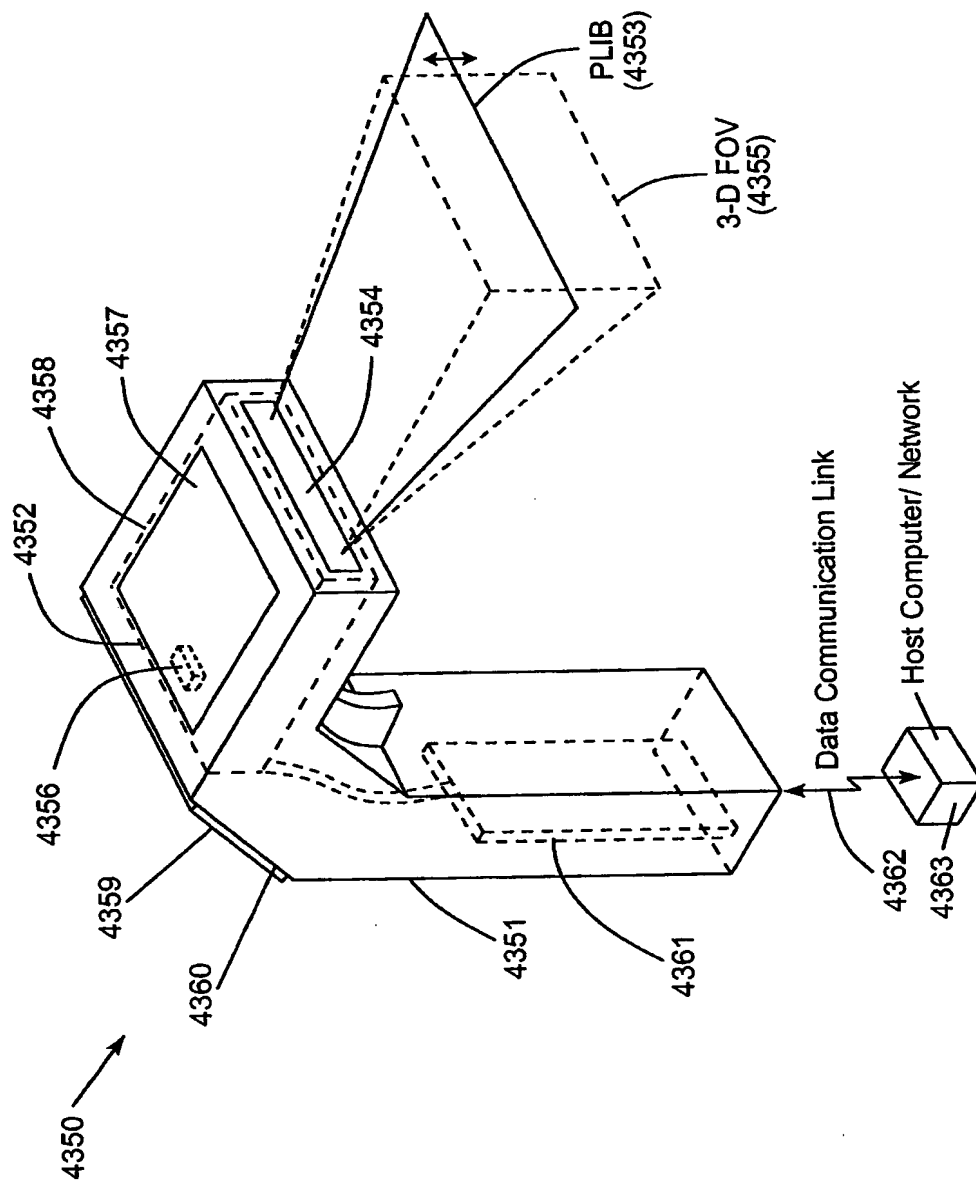
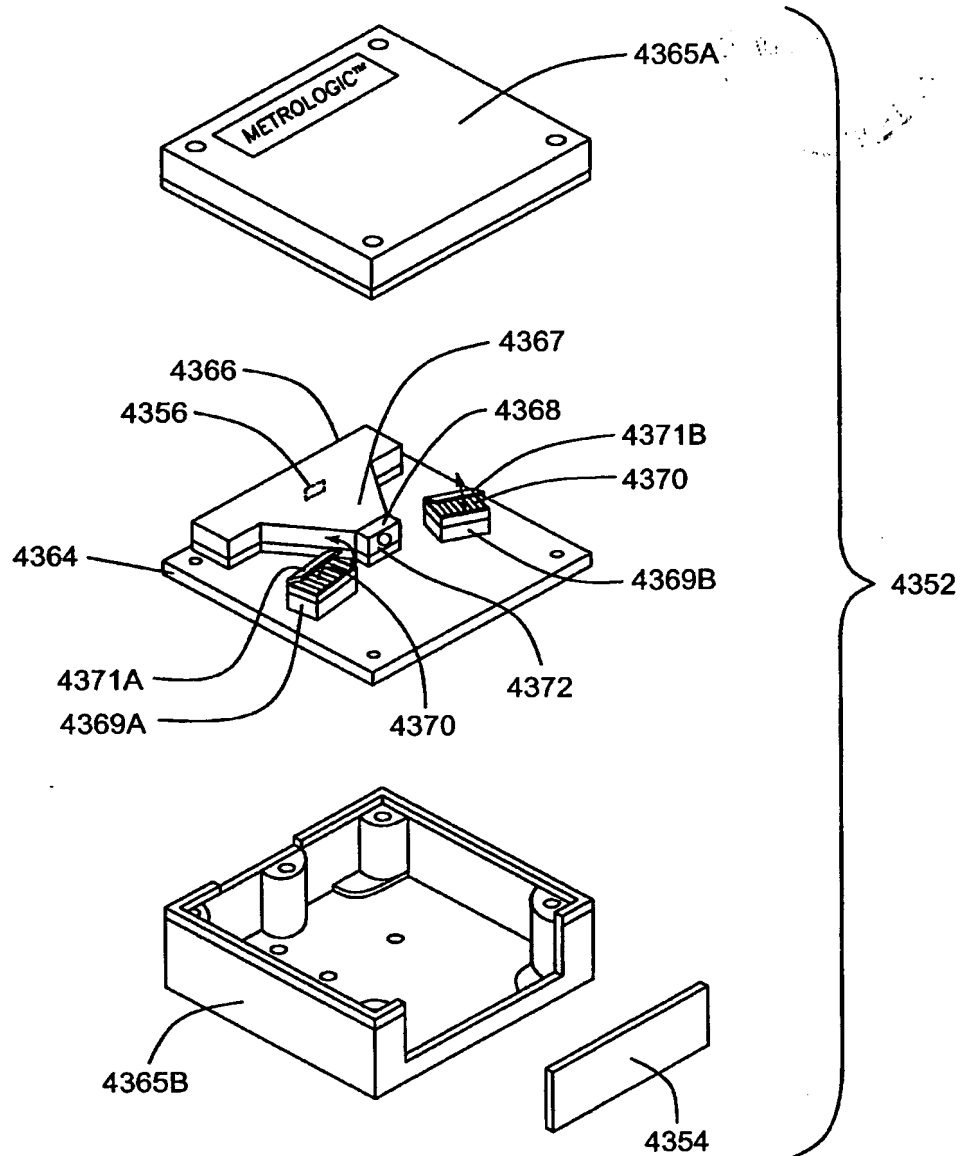


FIG. 63A

20060207 0454900F



EO or Mechanically
Rotating Iris
Fig. 1123A-23B

FIG. 63B

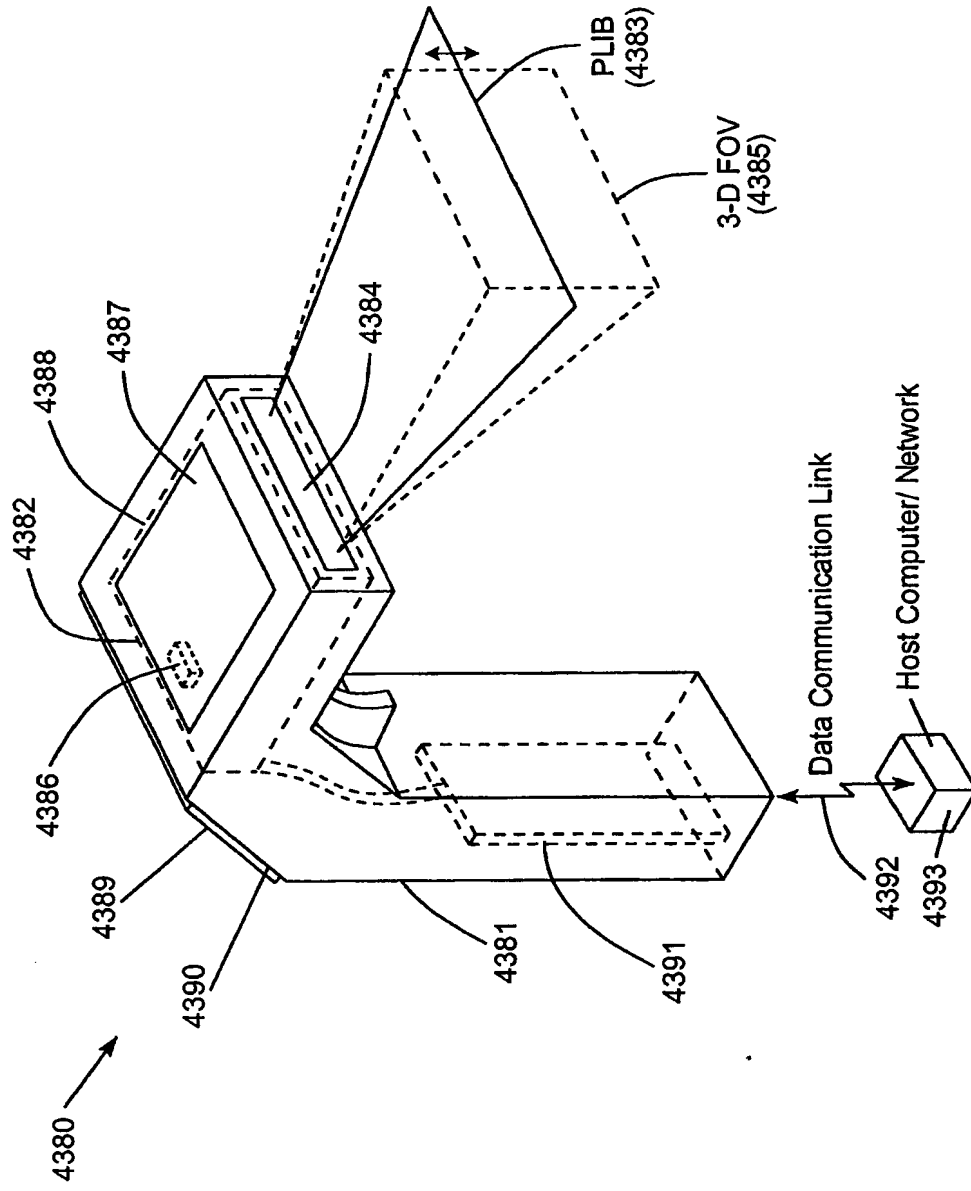
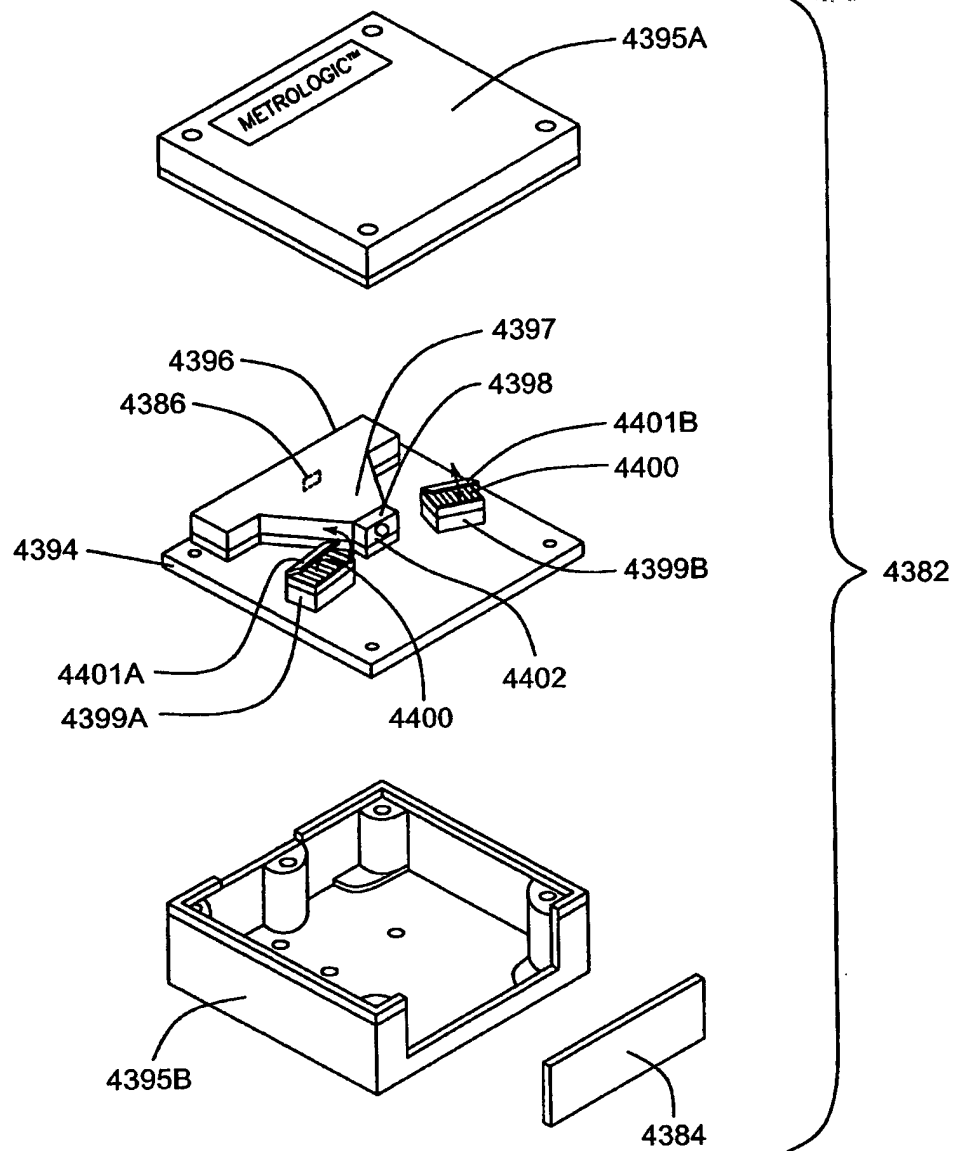


FIG. 64A

2006.03.01 09:25:00



E-optical Shutter
Before IFD Lens
Fig. 1124A

FIG. 64B

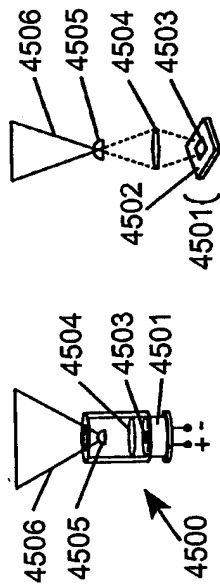


FIG. 65A

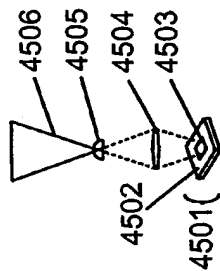


FIG. 65B

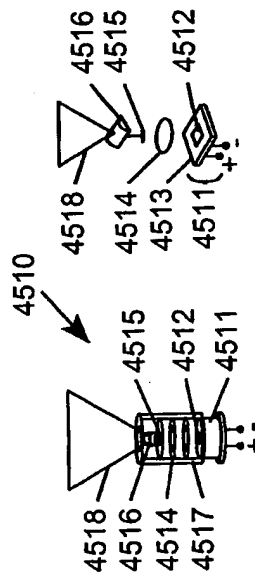


FIG. 66A

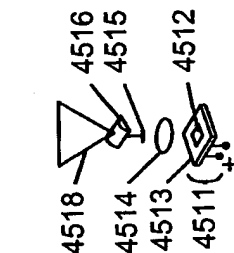


FIG. 66B

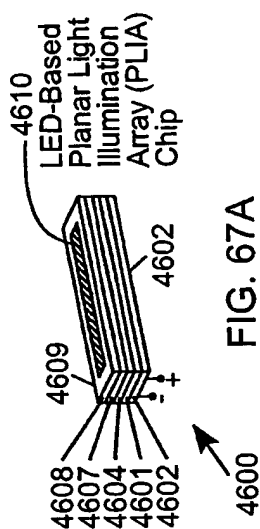


FIG. 67A

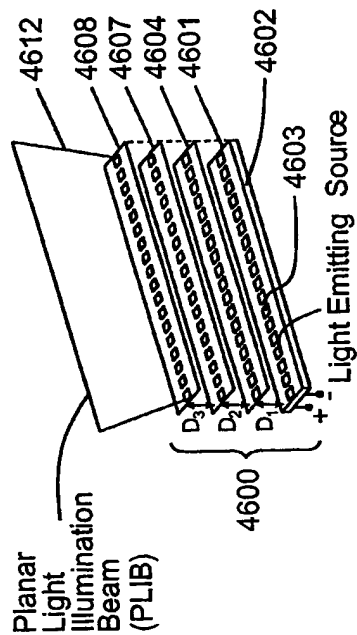


FIG. 67B

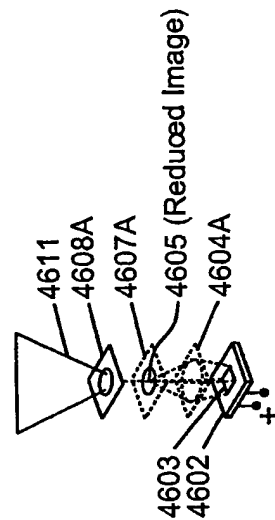


FIG. 67C

200004529001

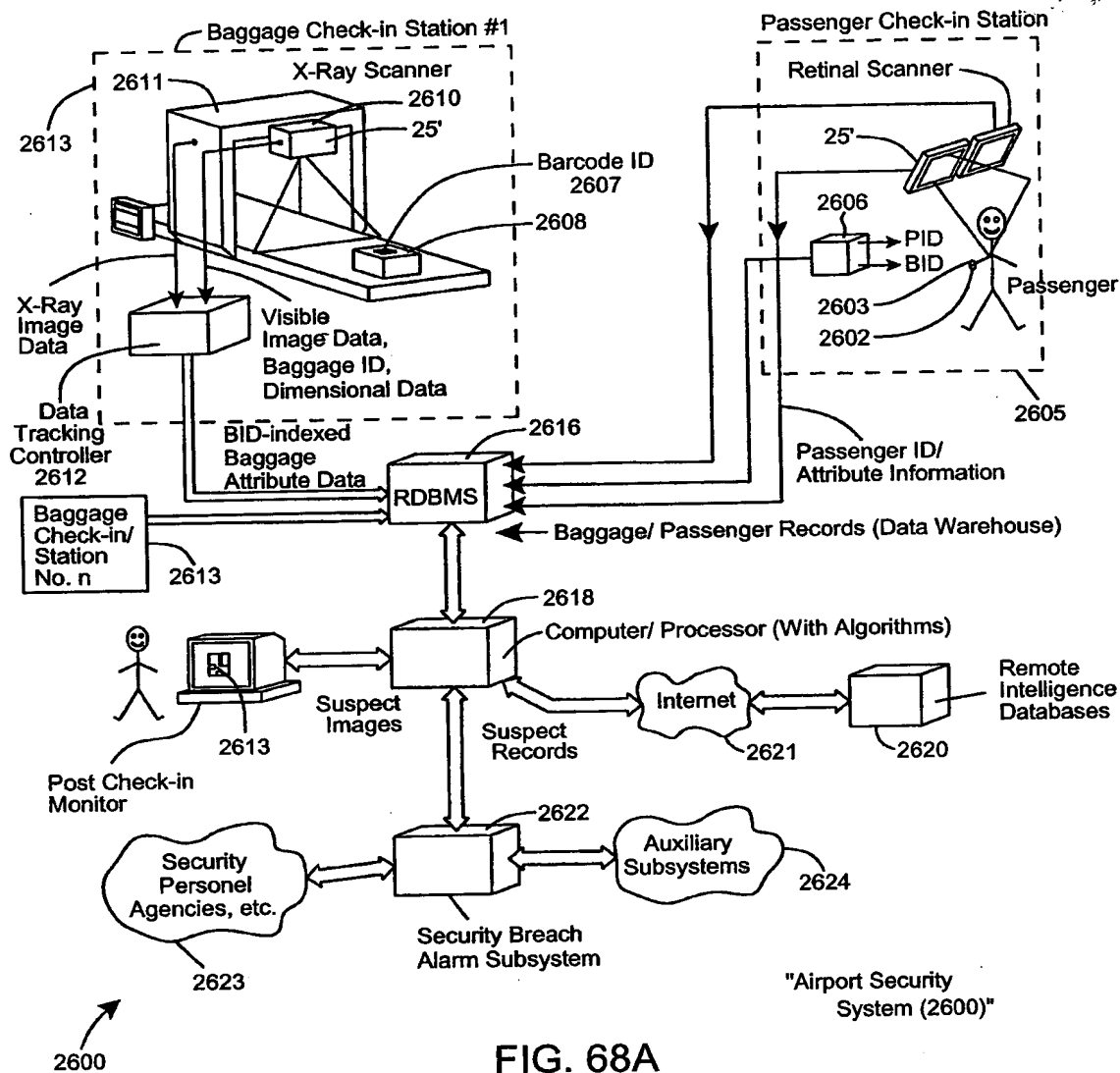


FIG. 68A

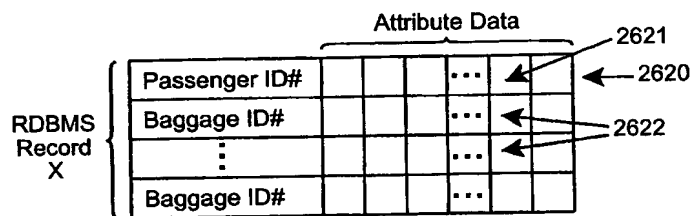
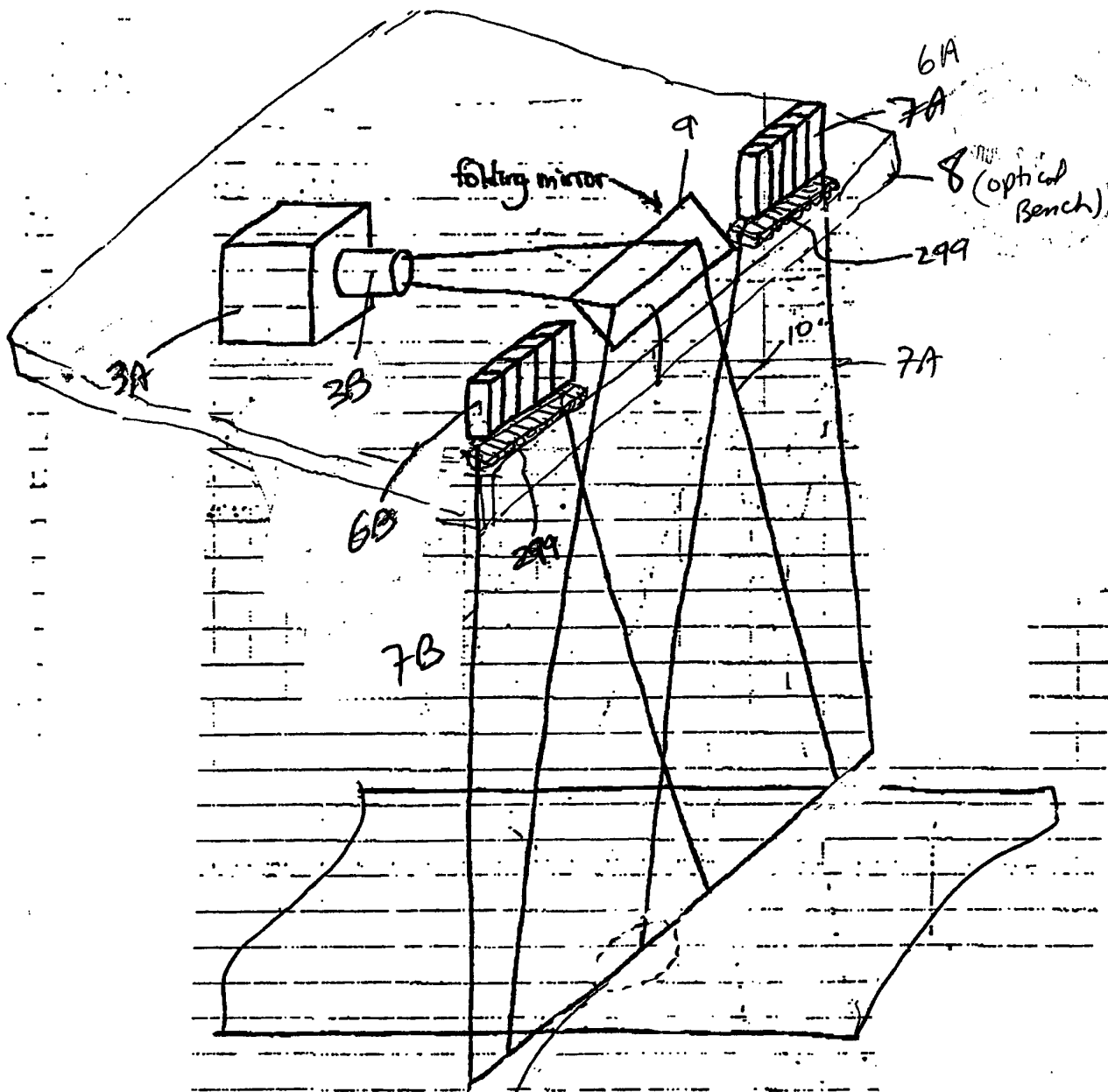


FIG. 68B

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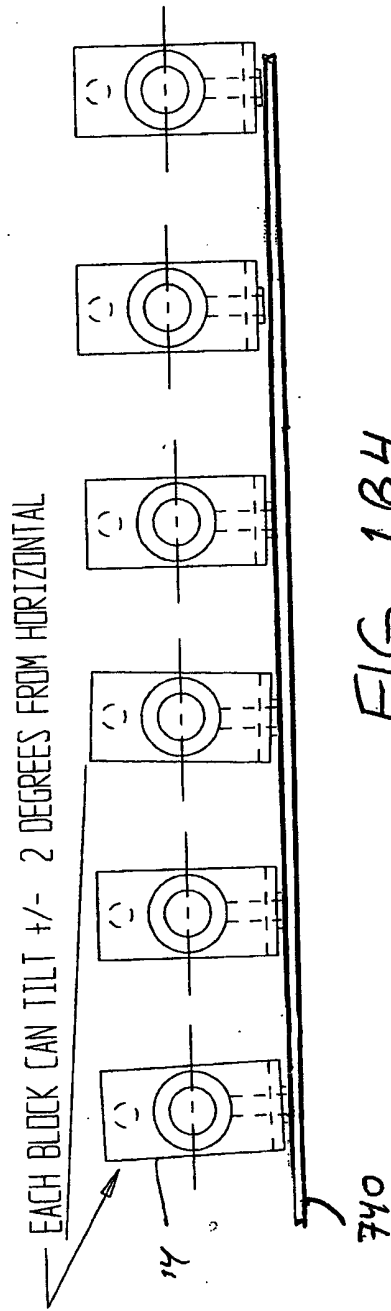


1A

FIG 1B1

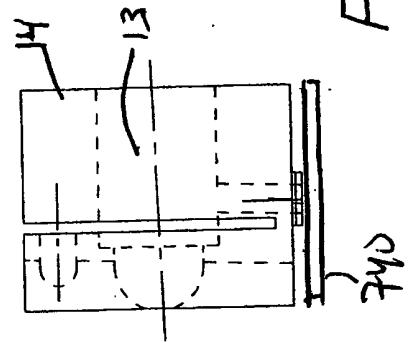
Magnified field of view of
CCD sensor element on
object
width of projected
Planar laser illumination
beam on
object

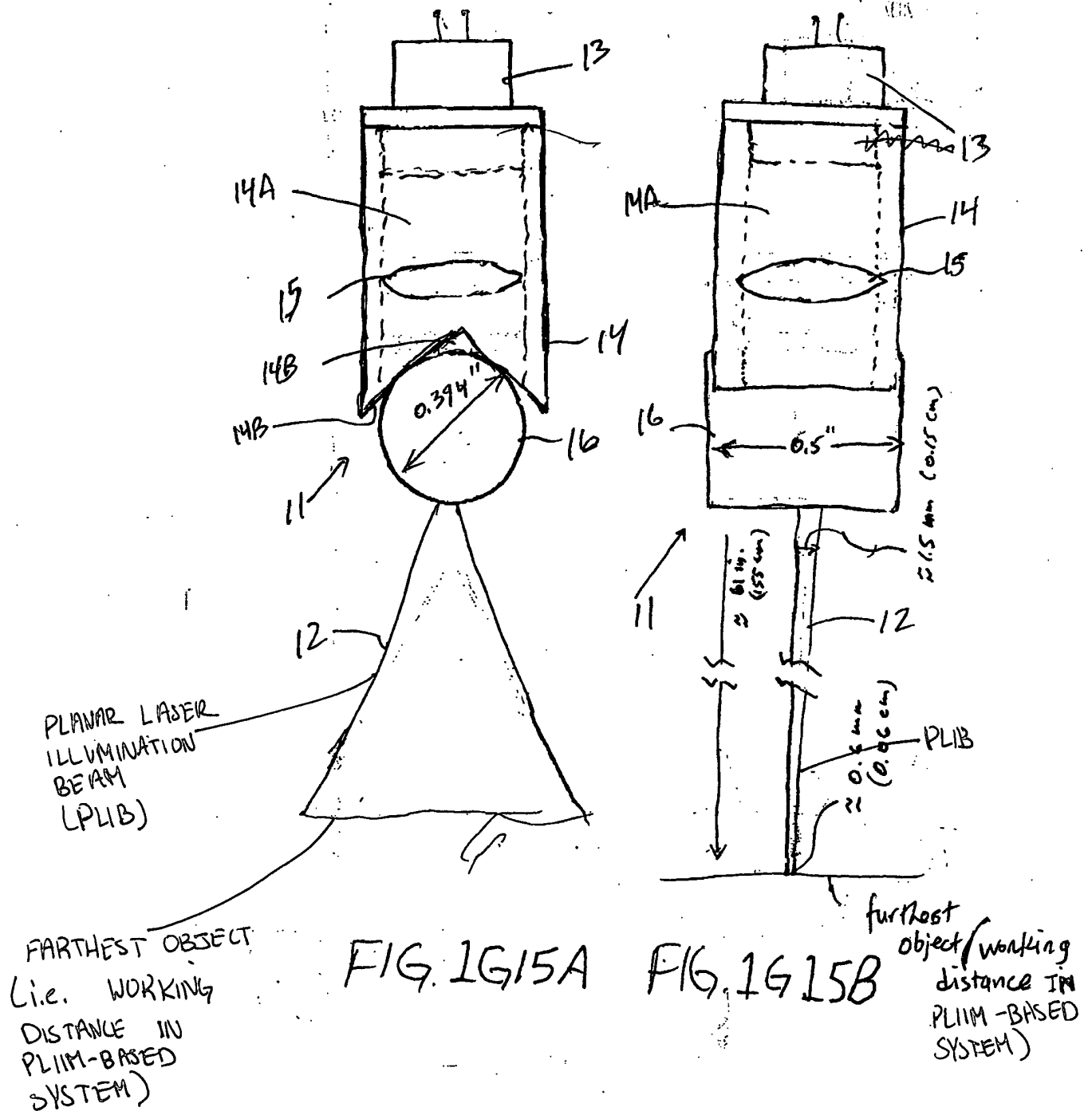
FIG 1B3



FORWARD

VLD BLOCK CAN PITCH FORWARD FOR ALIGNMENT WITH OTHER VLD BEAMS





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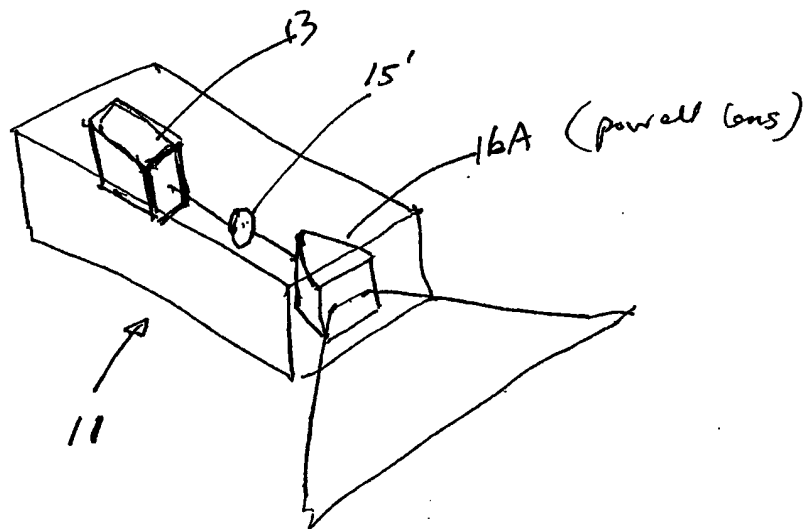


FIG. 1G.16A

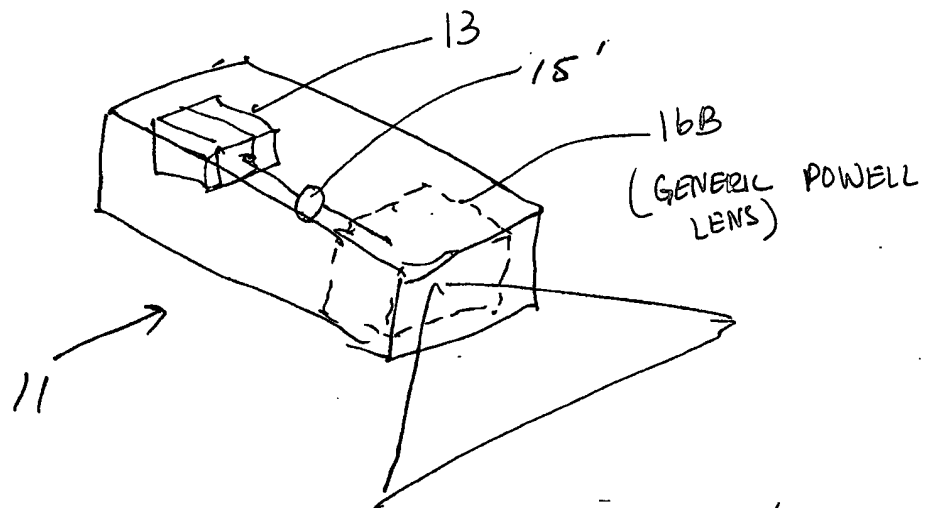


FIG. 1G.16B

PLIM of
powell lens

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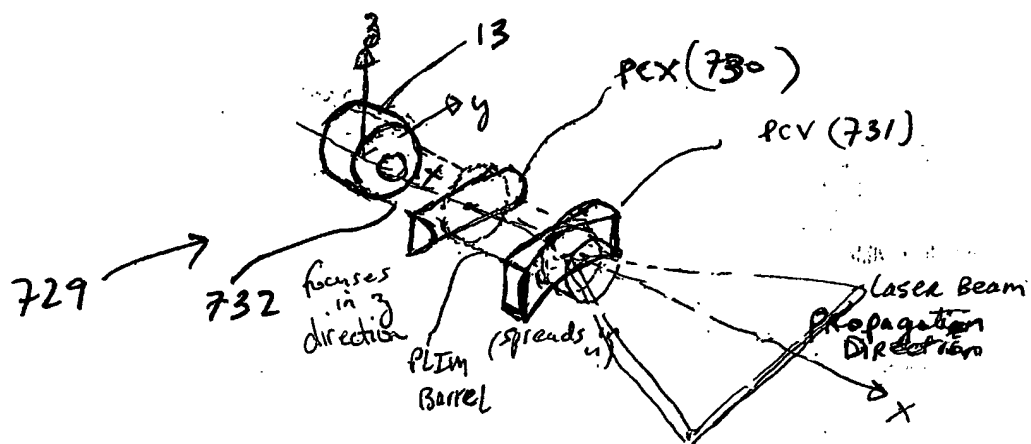


FIG. 16.17A

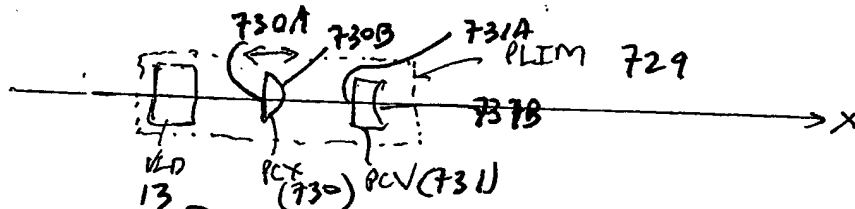


FIG. 16.17B

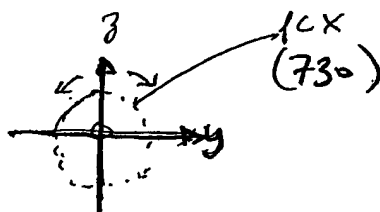


FIG. 16.17C

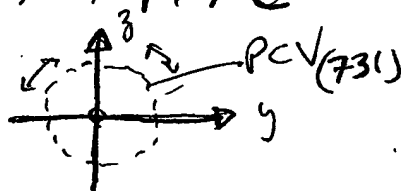


FIG. 16.17D

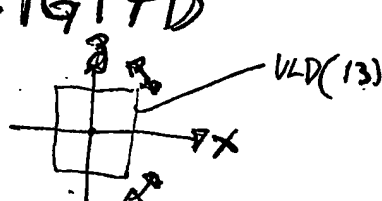


FIG. 16.17E

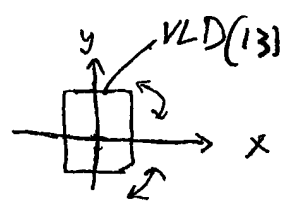


FIG. 16.17F

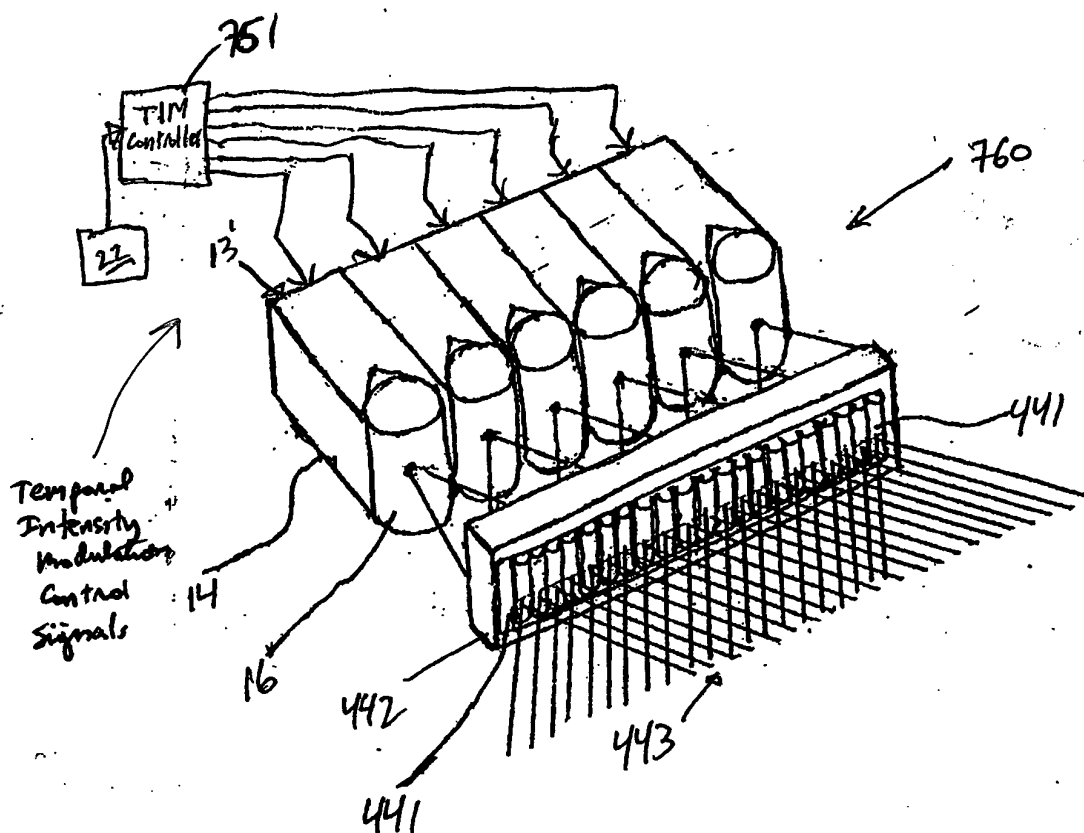
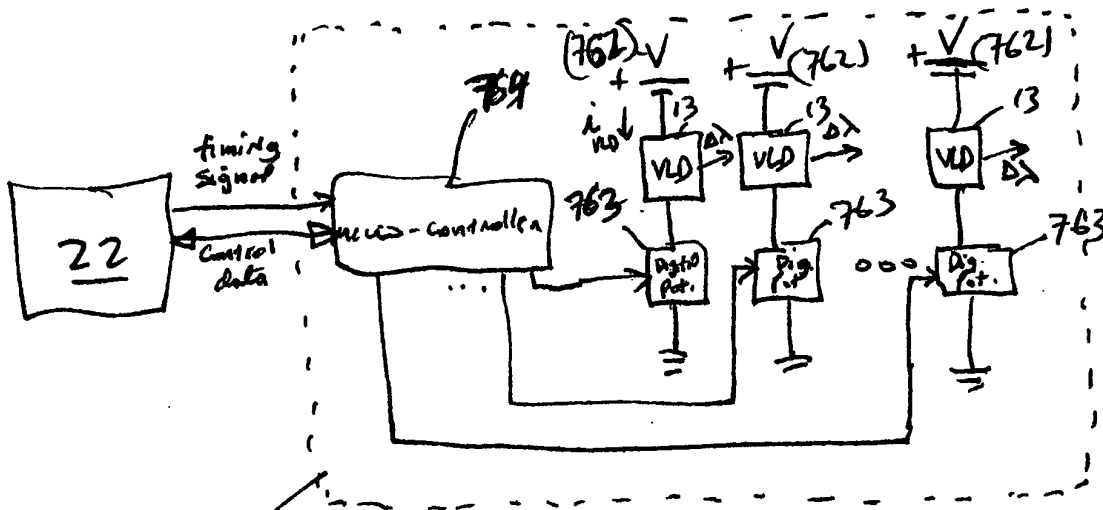


FIG. 1I 15C



761
(~~761~~ controller)

FIG. 1I15.D

Fourth Generalized Method of
Reducing Speckle-Noise Patterns
at Image Detection Array
of the FFD Subsystem (3)

(TFMP)

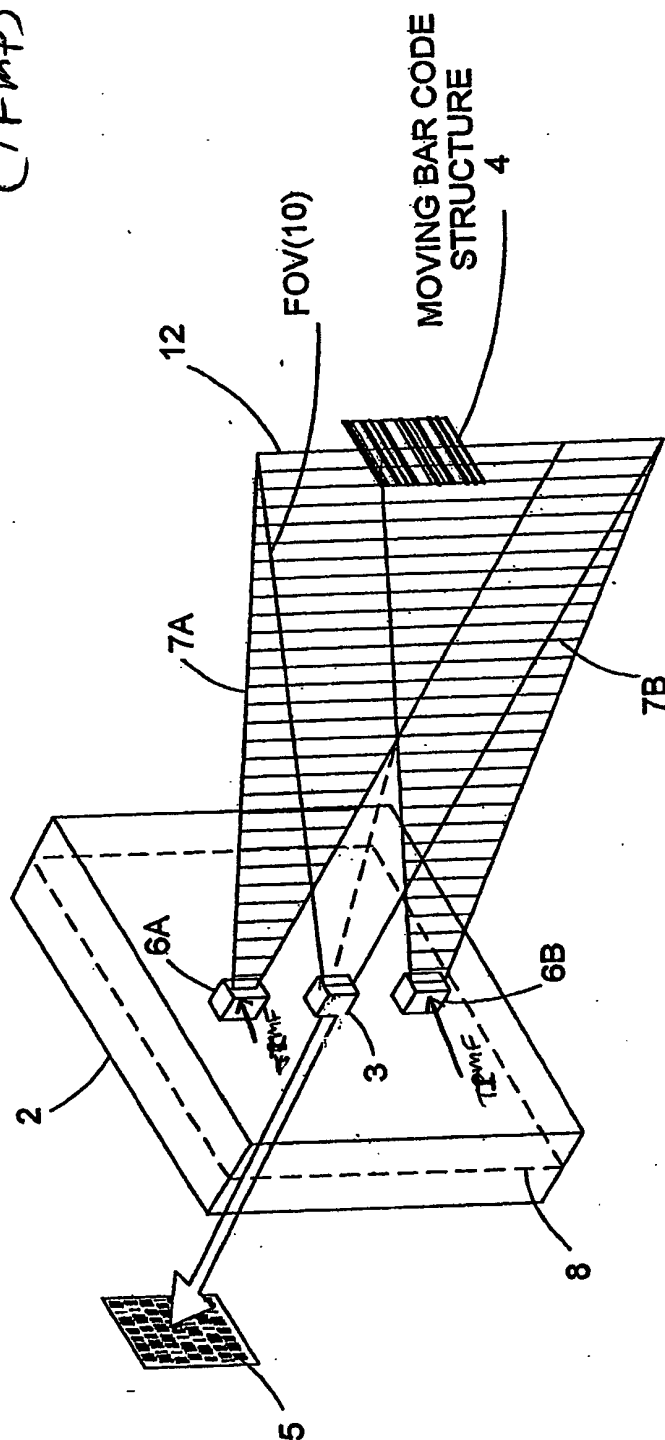


FIG. 1118A 1118

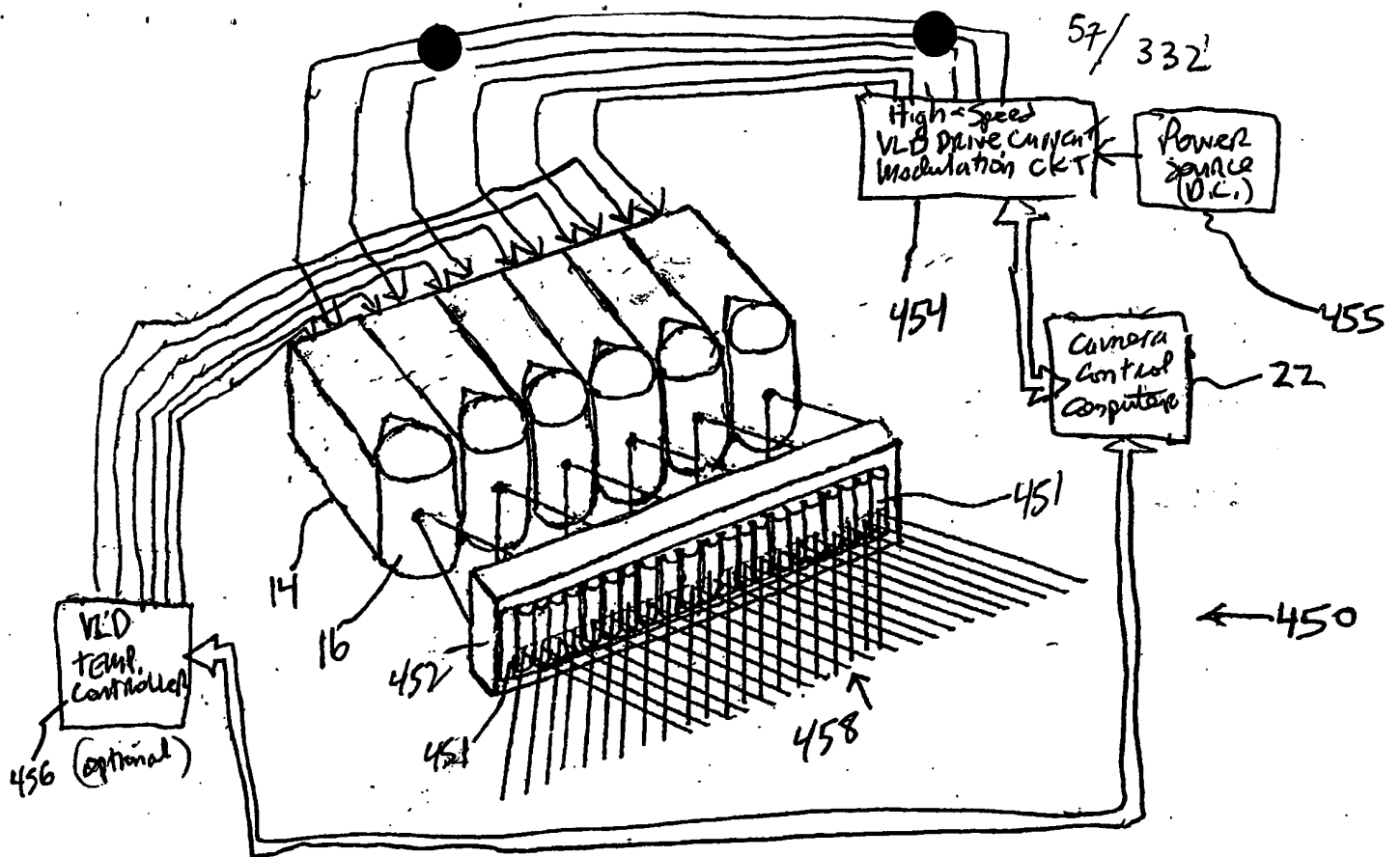
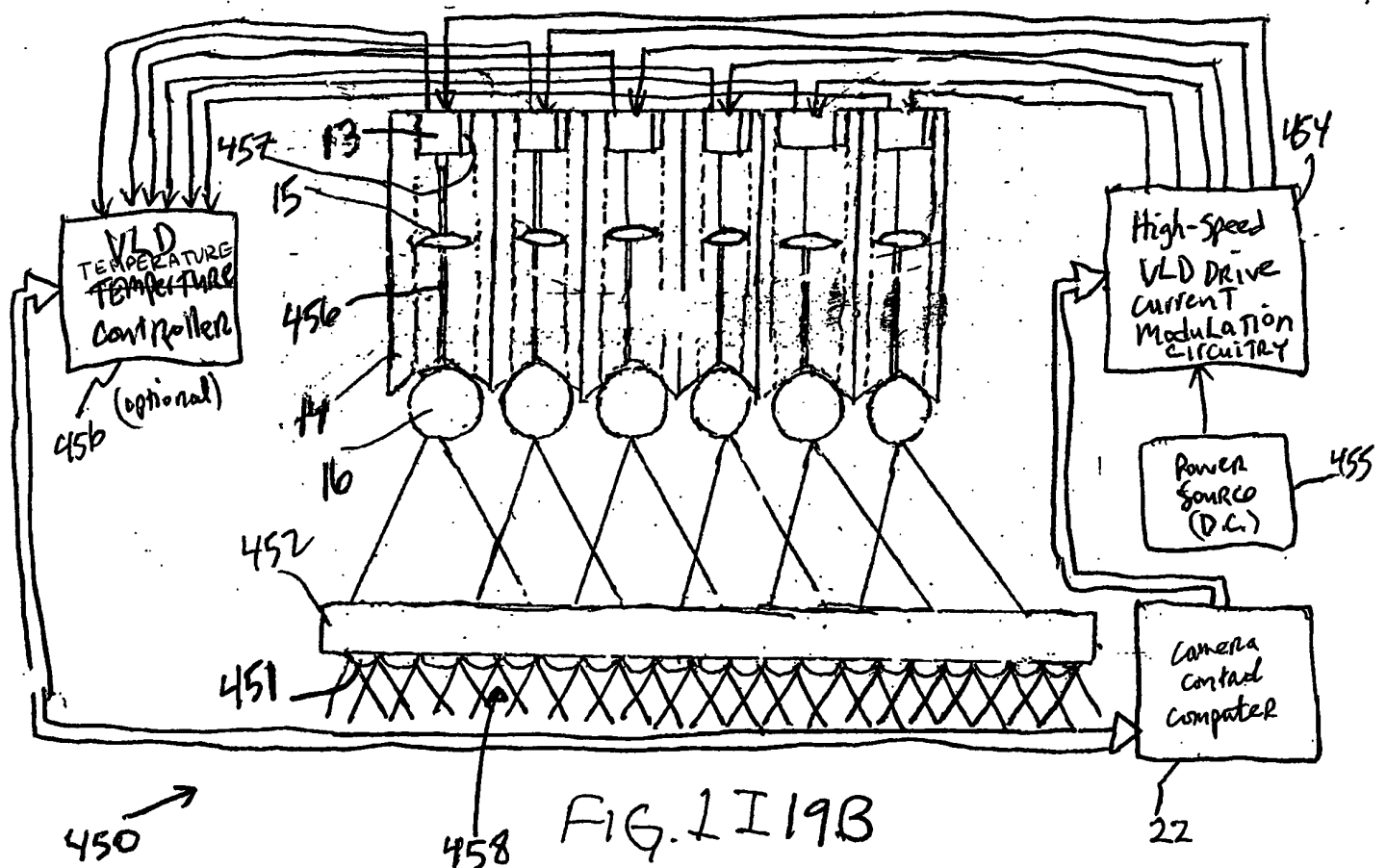


FIG. 1I 19A



Sixth Generalized Method of
Reducing Speckle-Noise Patterns
at Image Detection array
of the IFD Subsystem

(SIMF)

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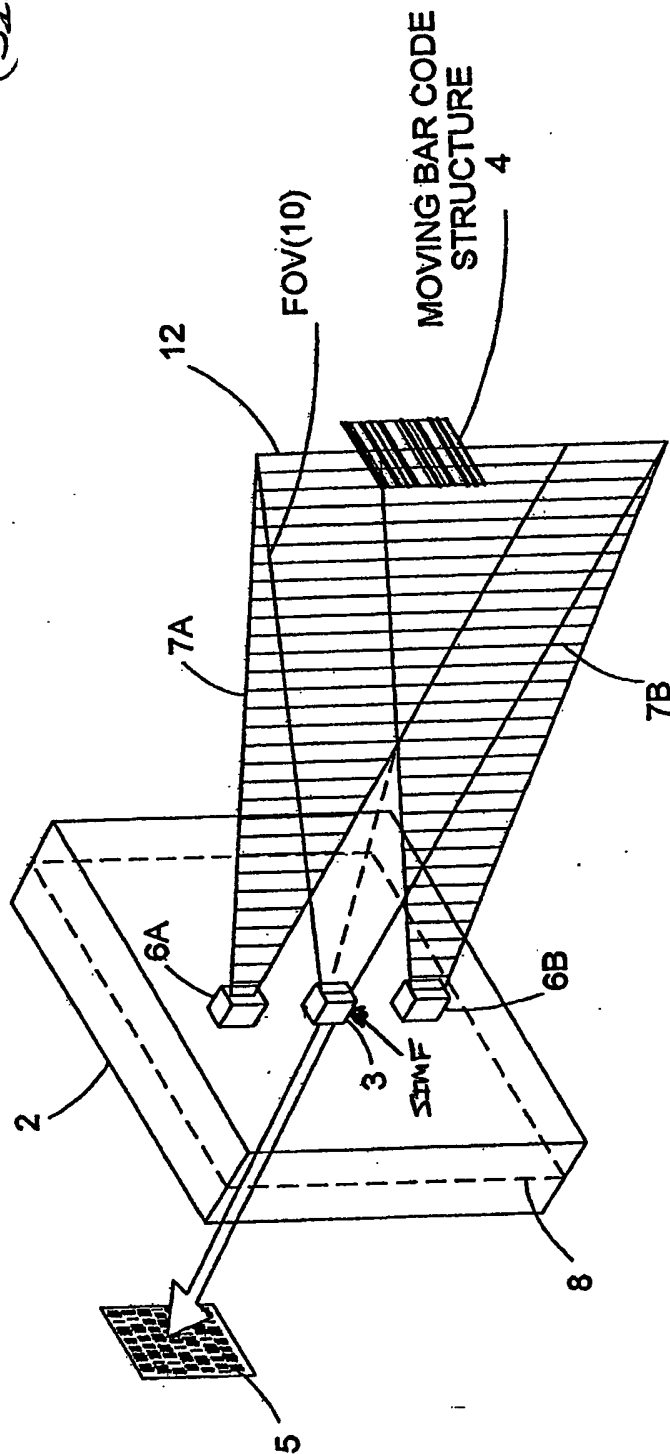
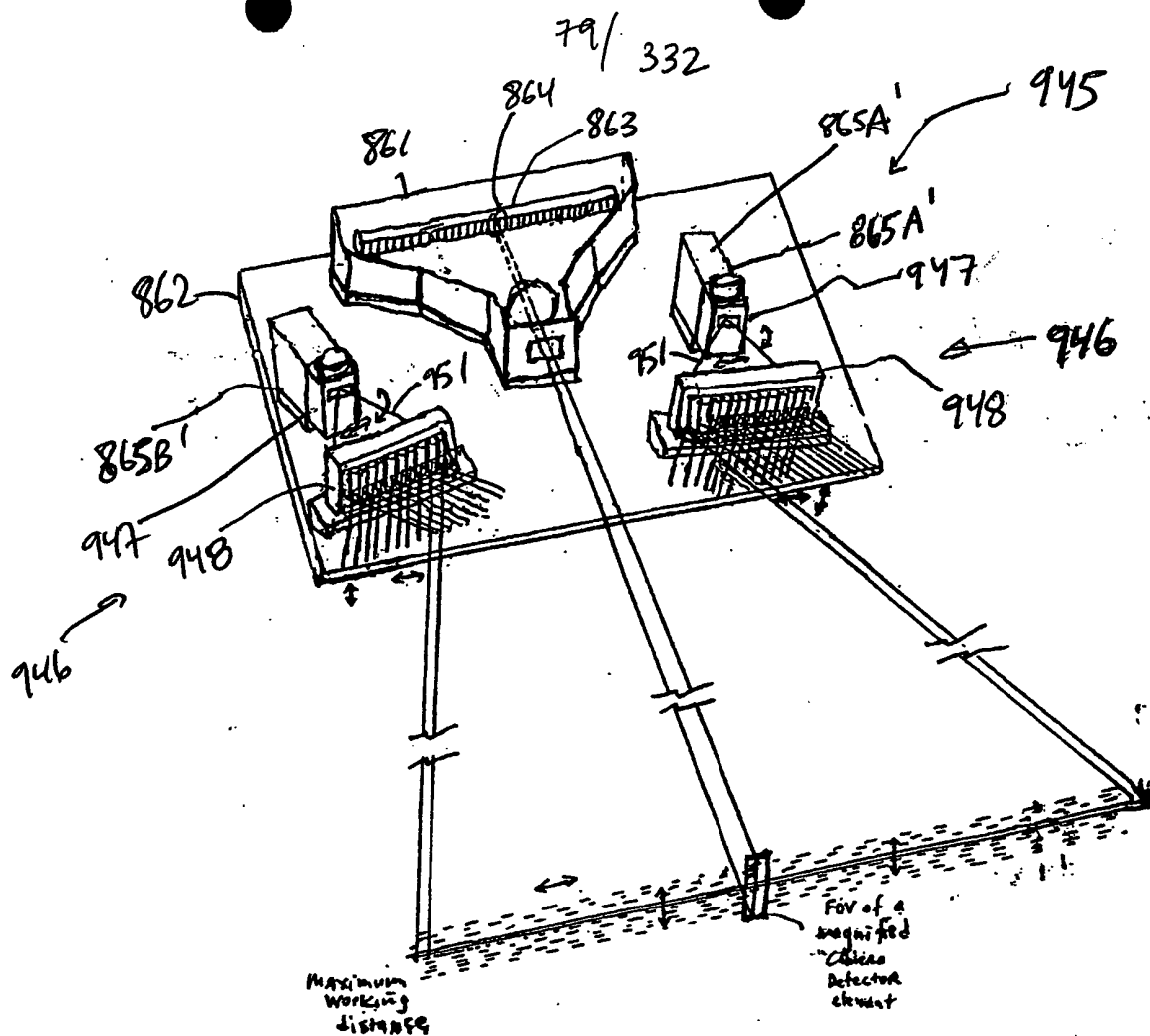


FIG. 1I 22



Lateral and Transverse Microoscillation of ALIB

FIG. 1 I 25 I 1

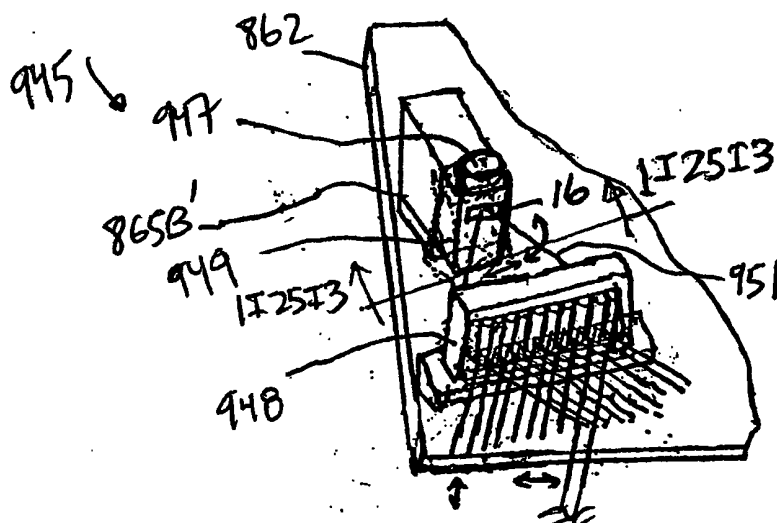


FIG. 1 I 25 I 2

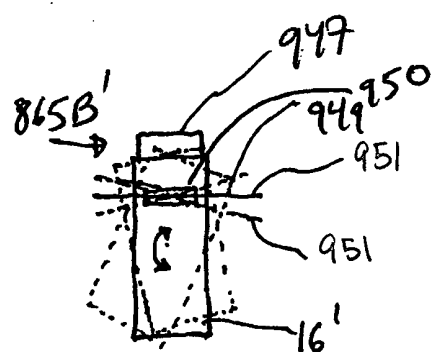


FIG. 1 I 25 I 3

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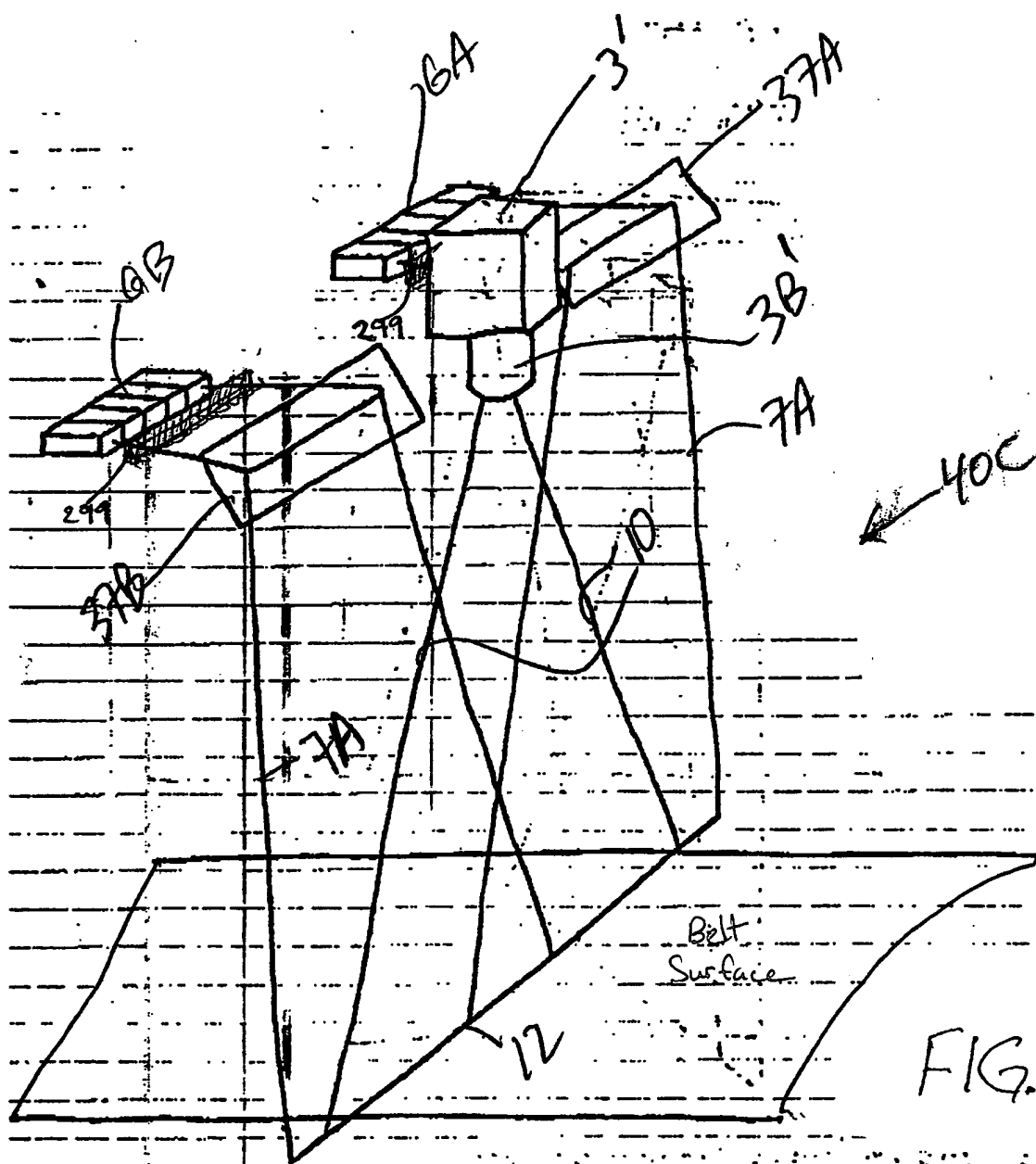


FIG. 2E1

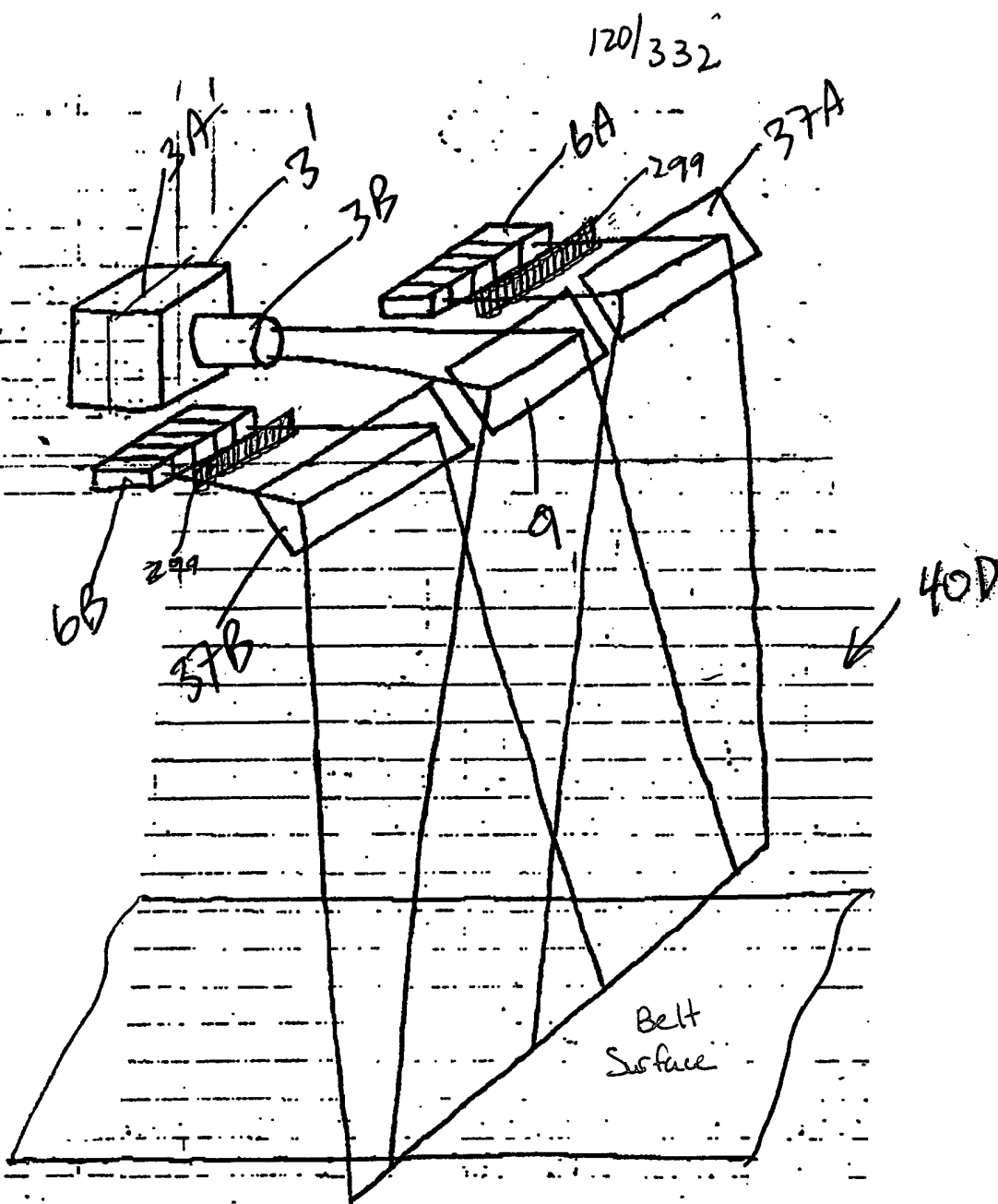


FIG. 2F1

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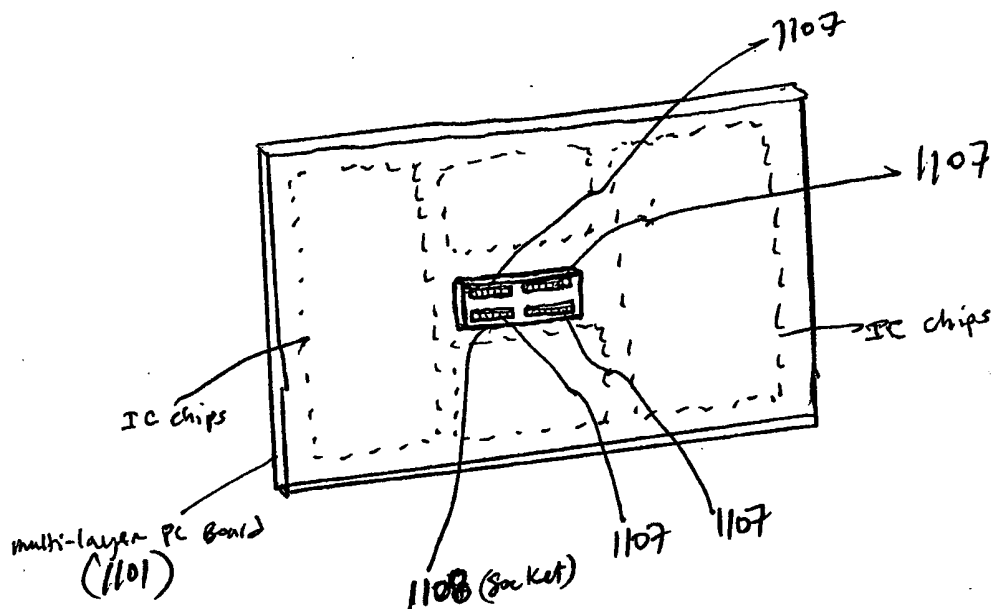


FIG. 3D6

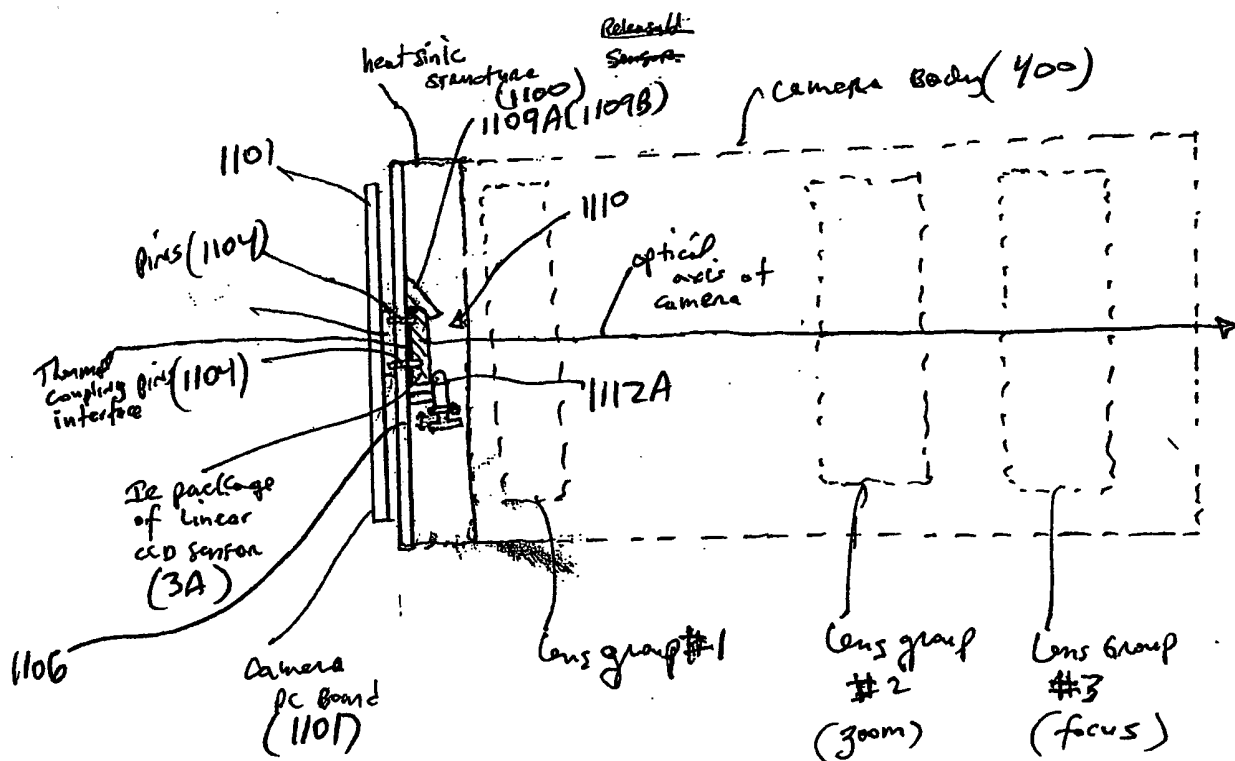


FIG. 3D7

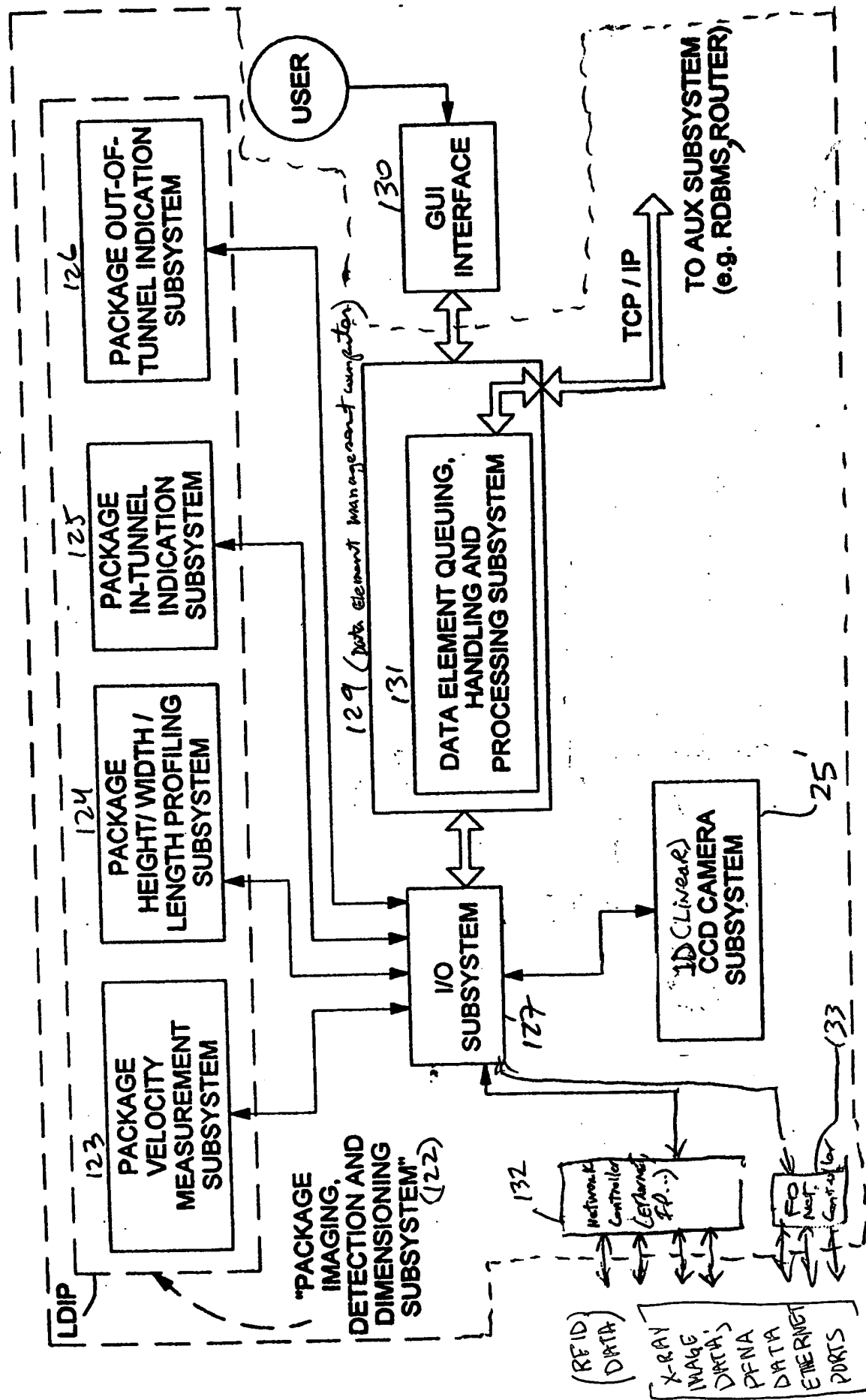


FIG. 10

120

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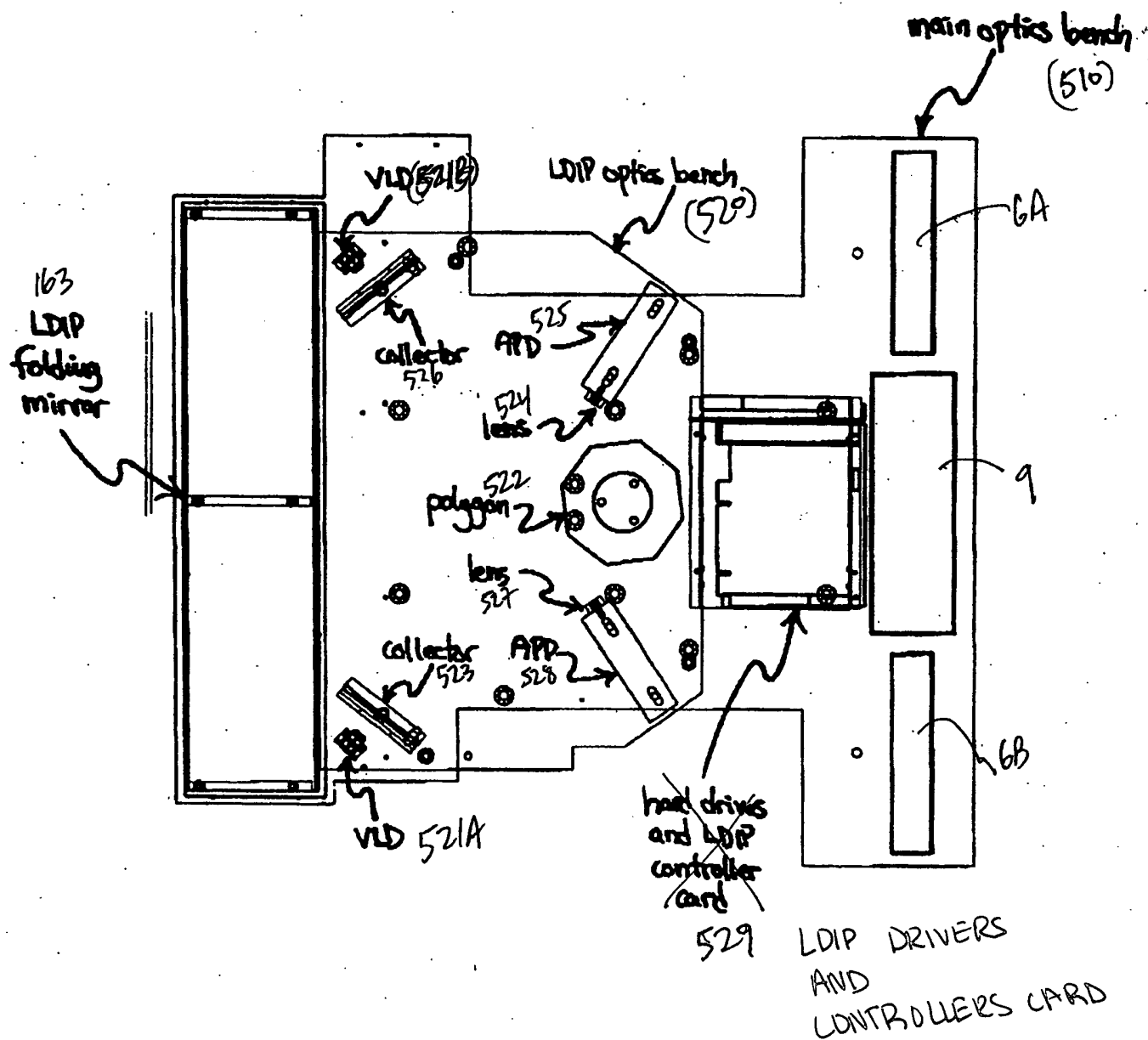


FIG. 12D

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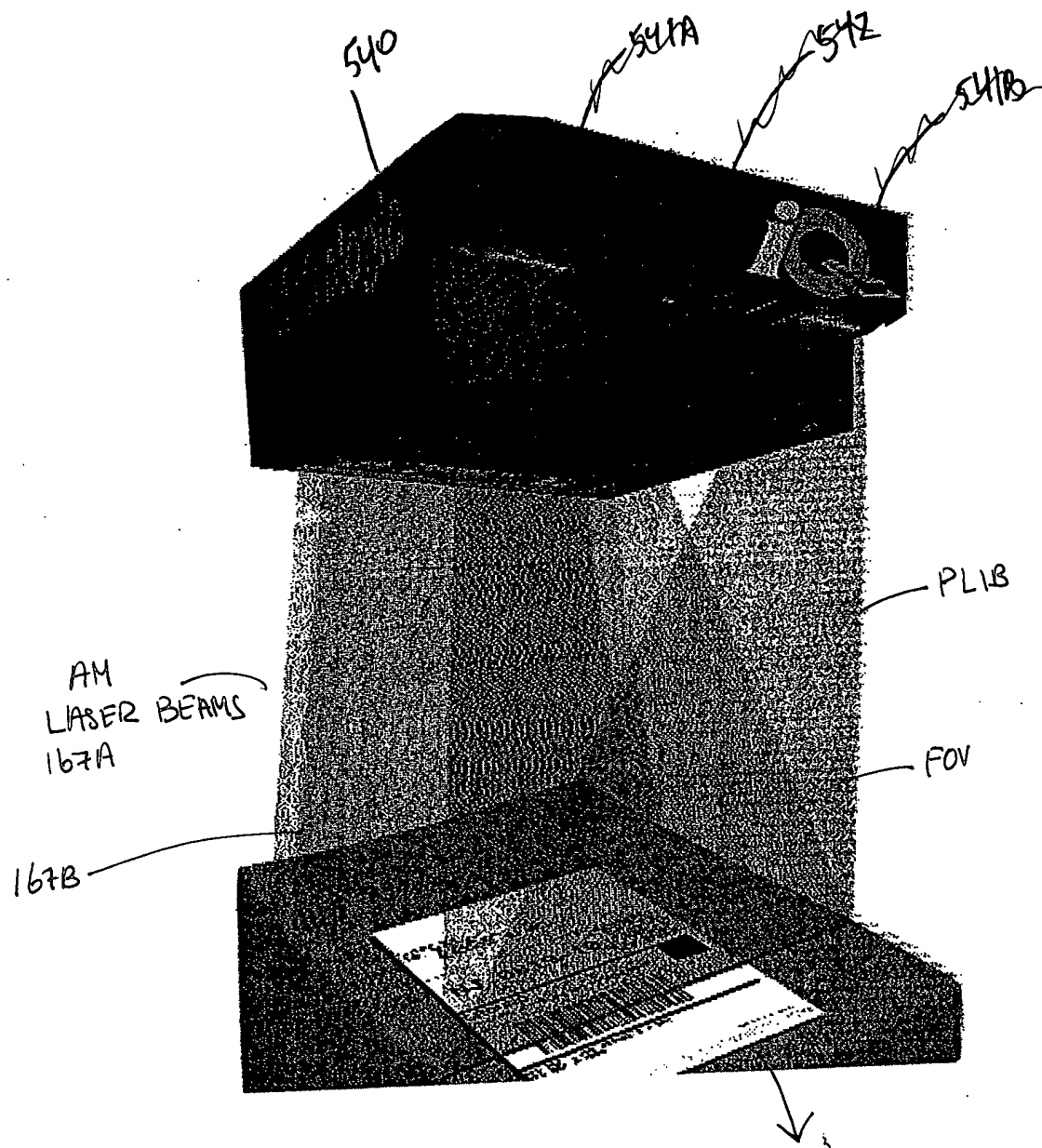


FIG. 13A

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SYSTEM OF THE
PRESENT INVENTION

CAMERA CONTROL PROCESS CARRIED OUT WITHIN THE CAMERA CONTROL SUBSYSTEM OF EACH OBJECT ATTRIBUTE ACQUISITION AND ANALYSIS SYSTEM IDENTIFICATION AND

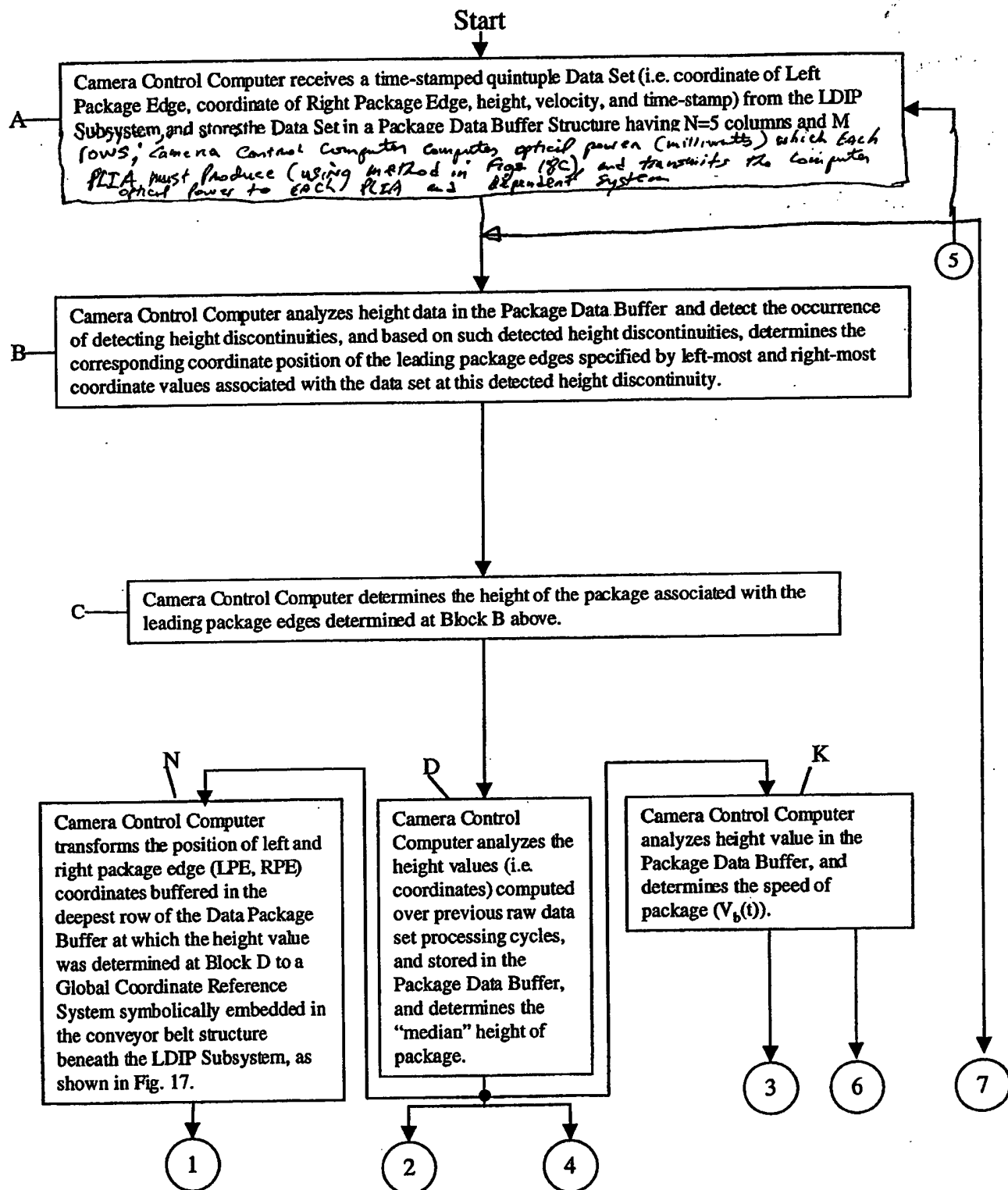


Fig. 18A

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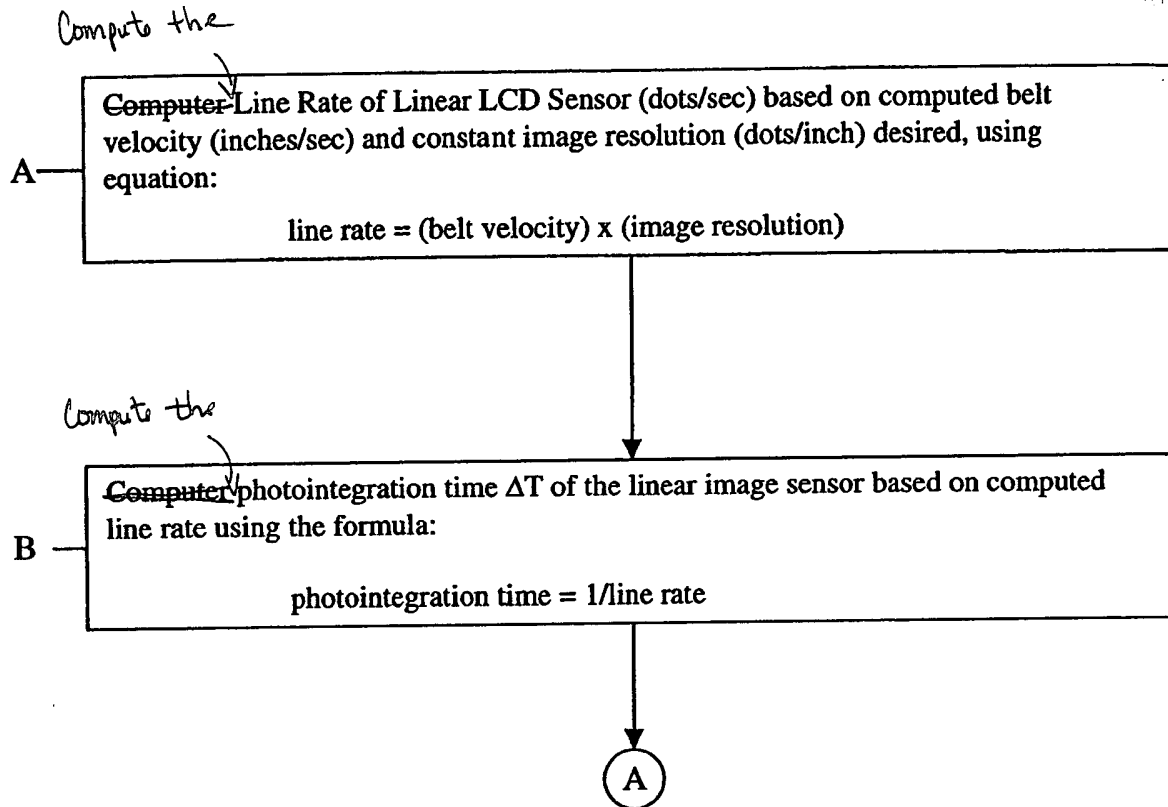


Fig. 18C1

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Compute optical power (milliwatts) of each PLIA based on computed photointegration time (ΔT) using the following formula:

$$\text{optical power of LD (milliwatts)} = \frac{\text{constant}}{\text{photointegration time } \Delta T}$$

period (under ΔT)

Fig. 18C2

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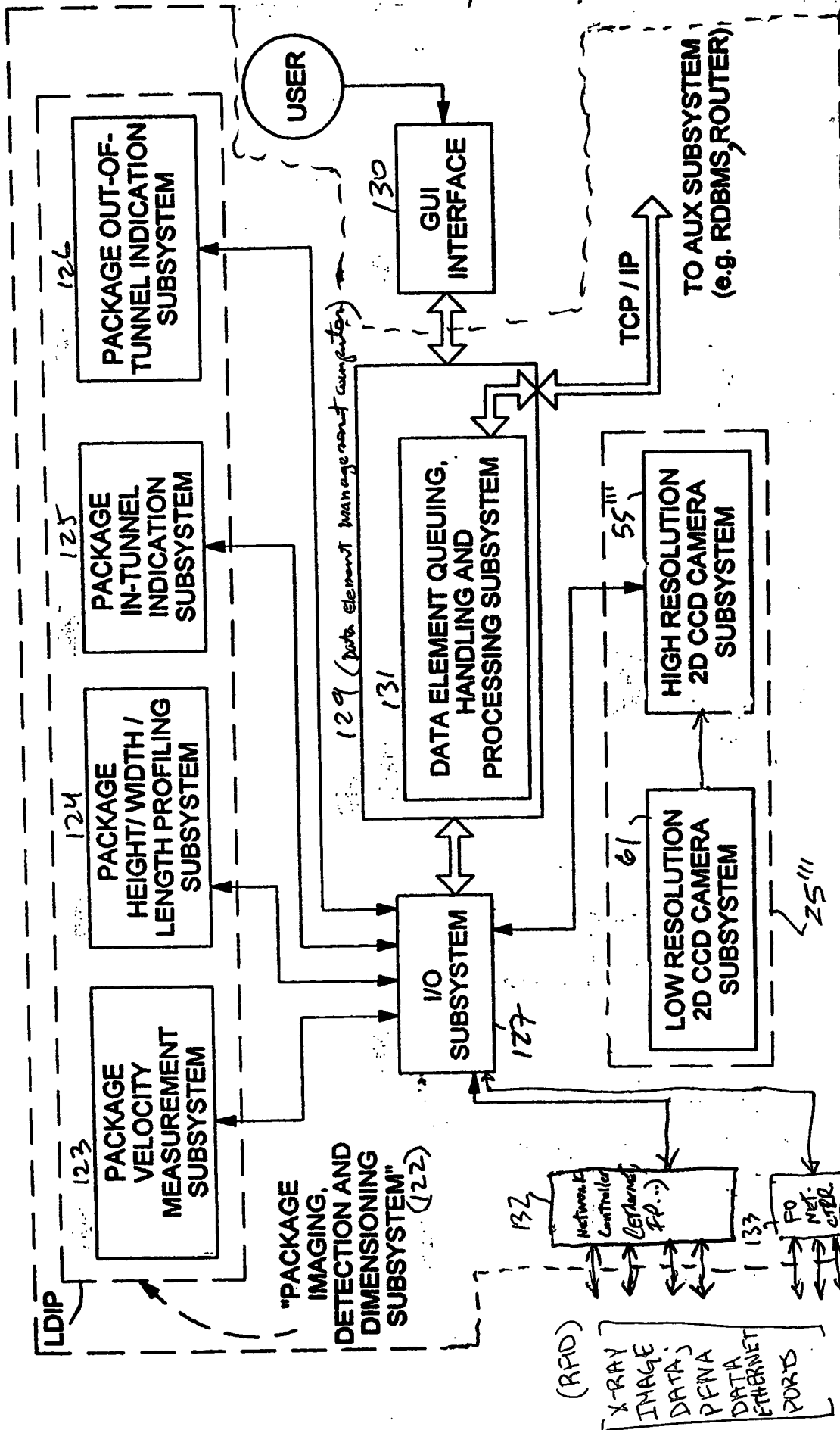


FIG. 25

140

233/332

580

586B

587

589

Host Computer
System
(Cash Register)

588

NET
CIR

I/O
Sub.

22

68

21

2

2

2

2

2

2

2

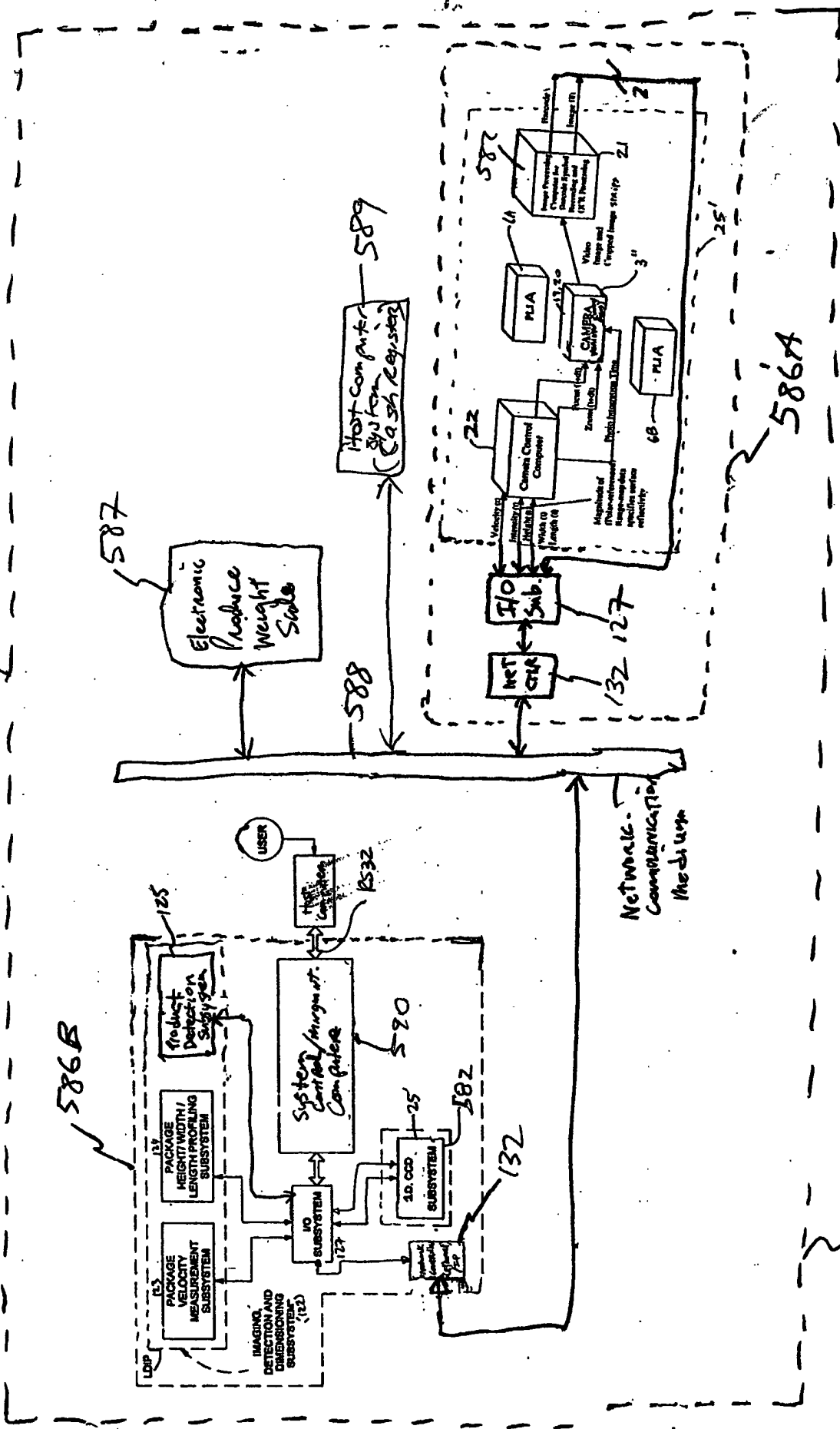
2

2

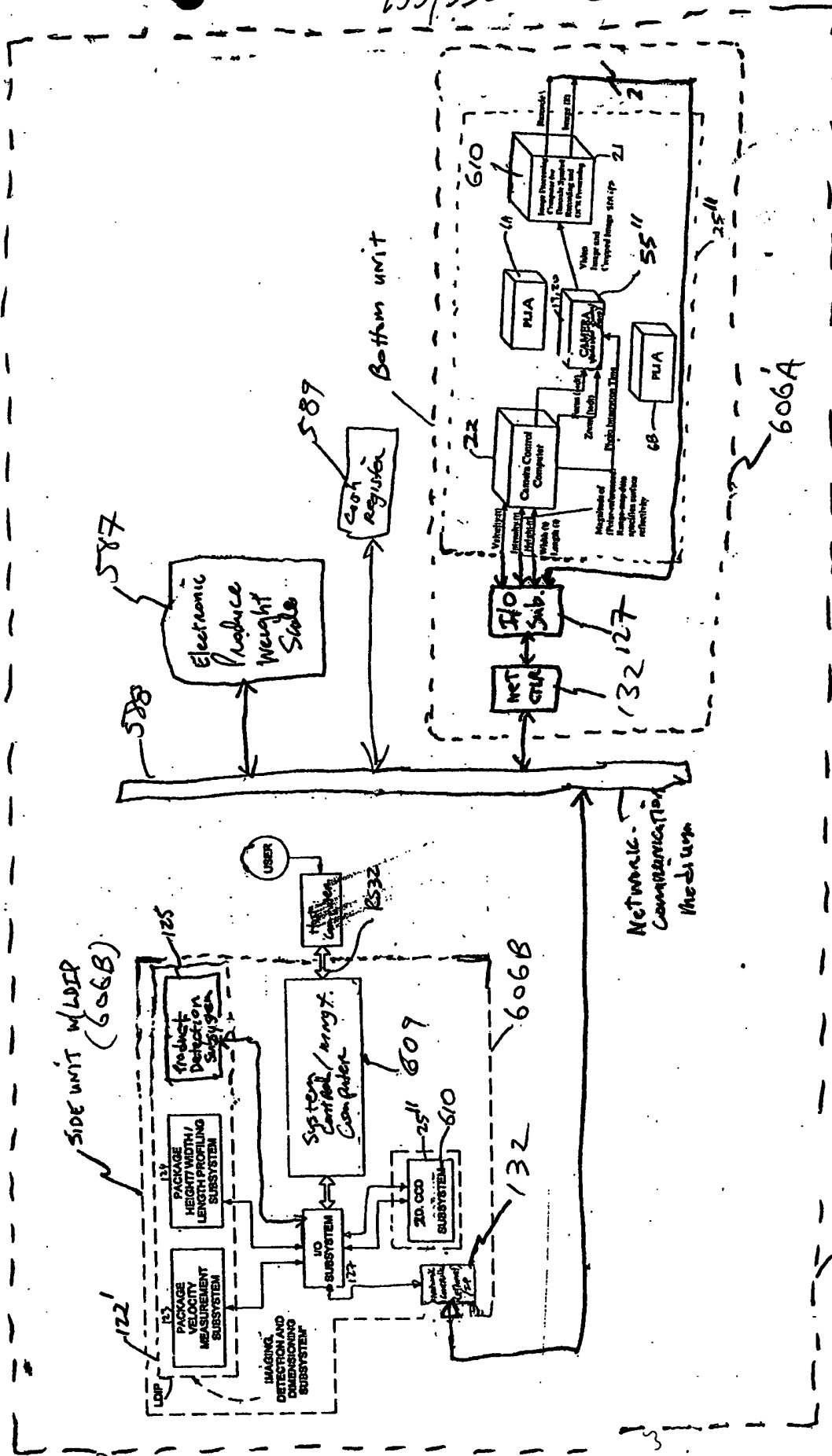
Network
Communication
Medium

586A

FIG. 33C Figs. 33C1 and 33C2



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~~FIG 34C~~ Figs. 34C1 and 34C2

009

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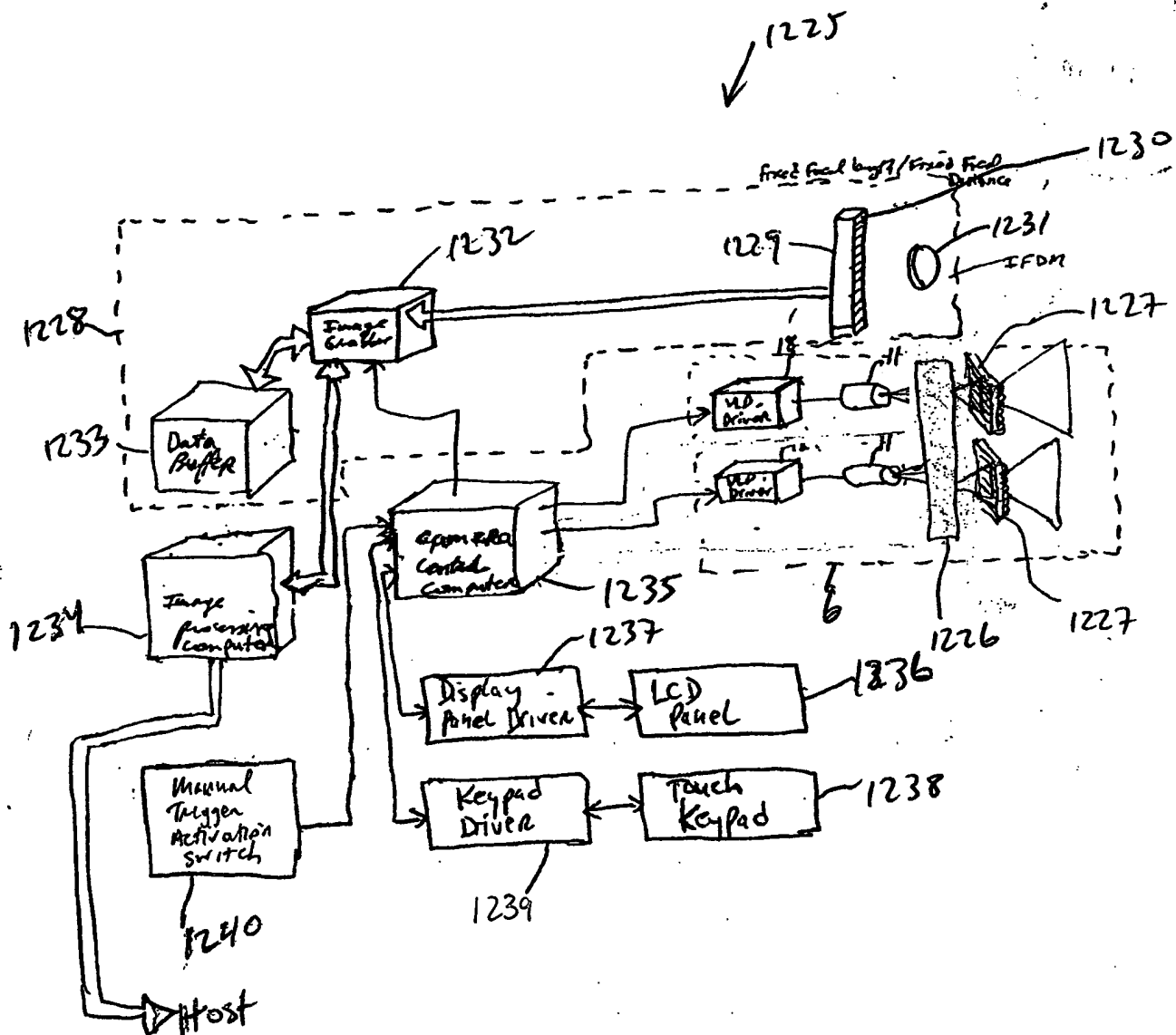


FIG. 40A1

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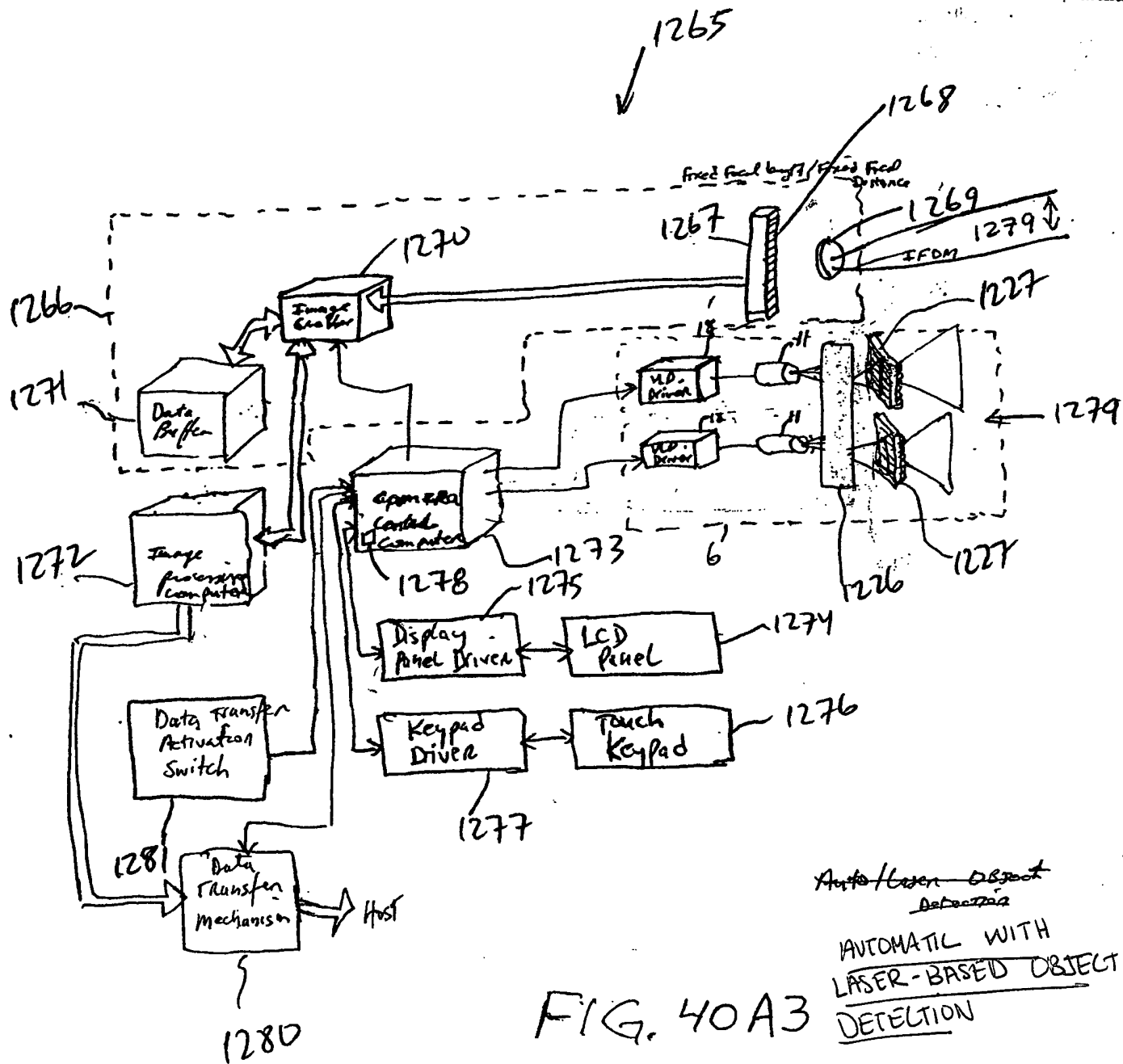
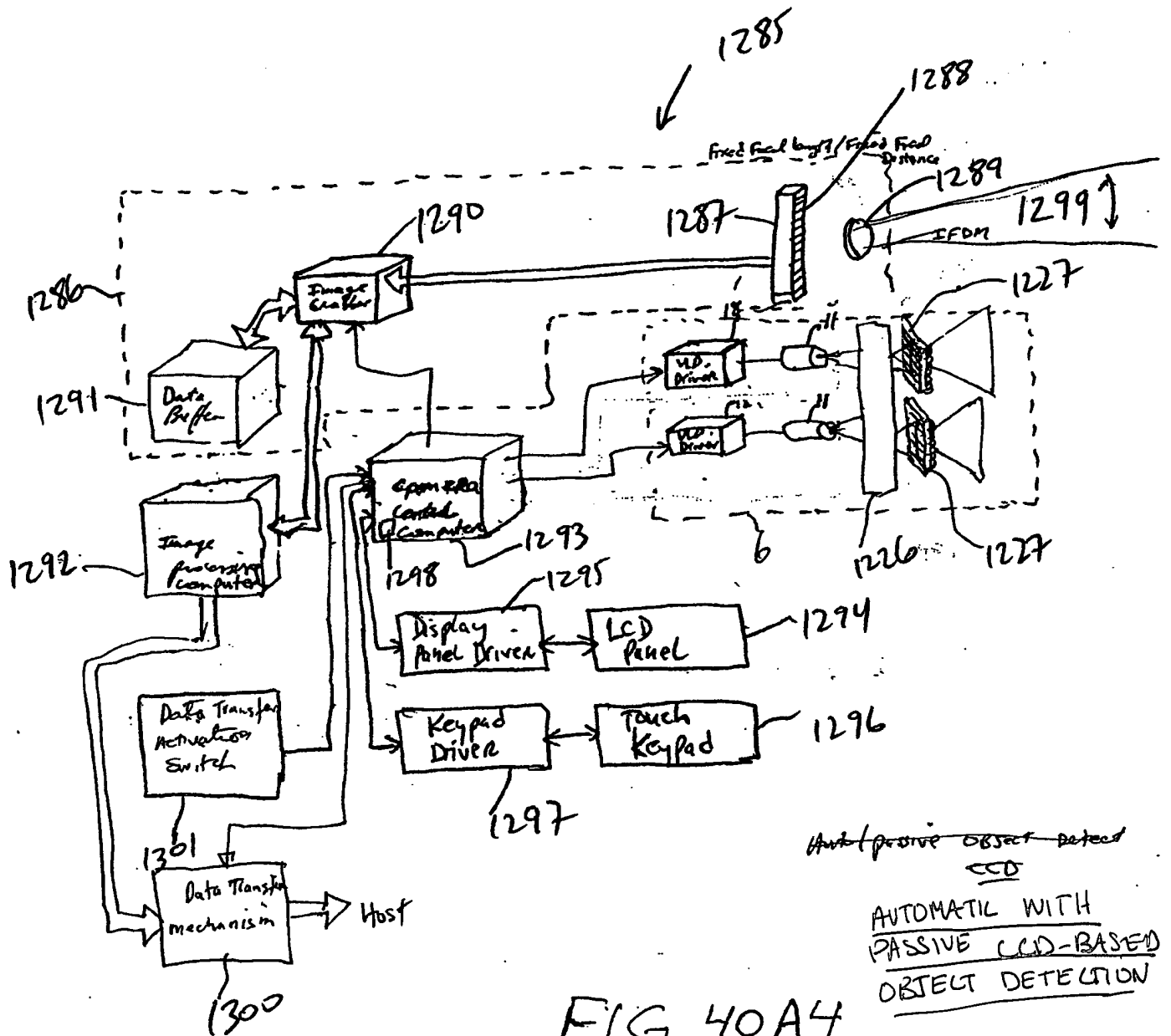


FIG. 40A3

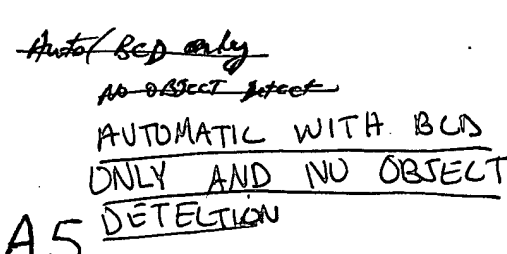
~~Auto / Laser Object~~
~~Detection~~

AUTOMATIC WITH
LASER-BASED OBJECT
DETECTION

247/332



1305
↓



DETECTION

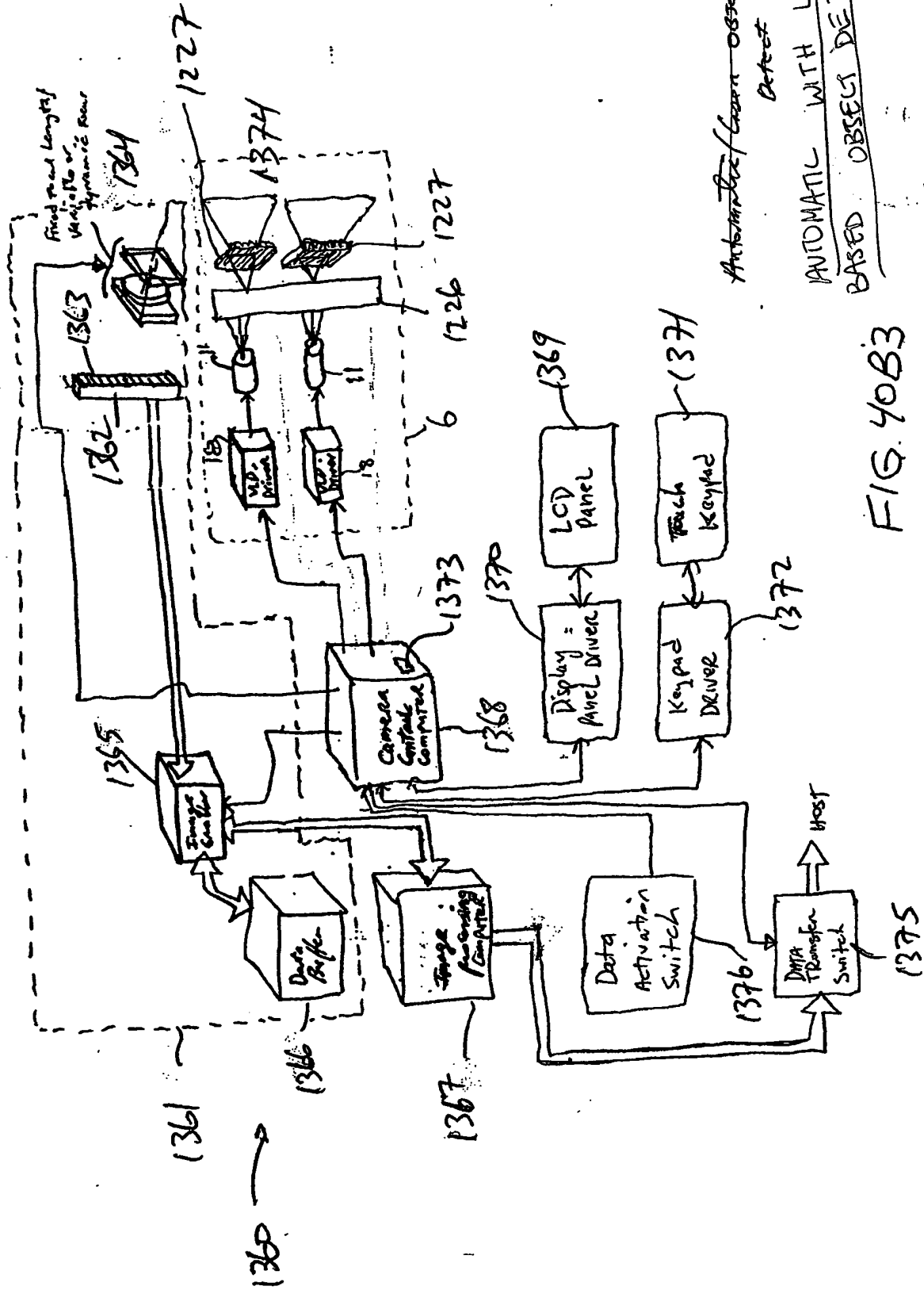
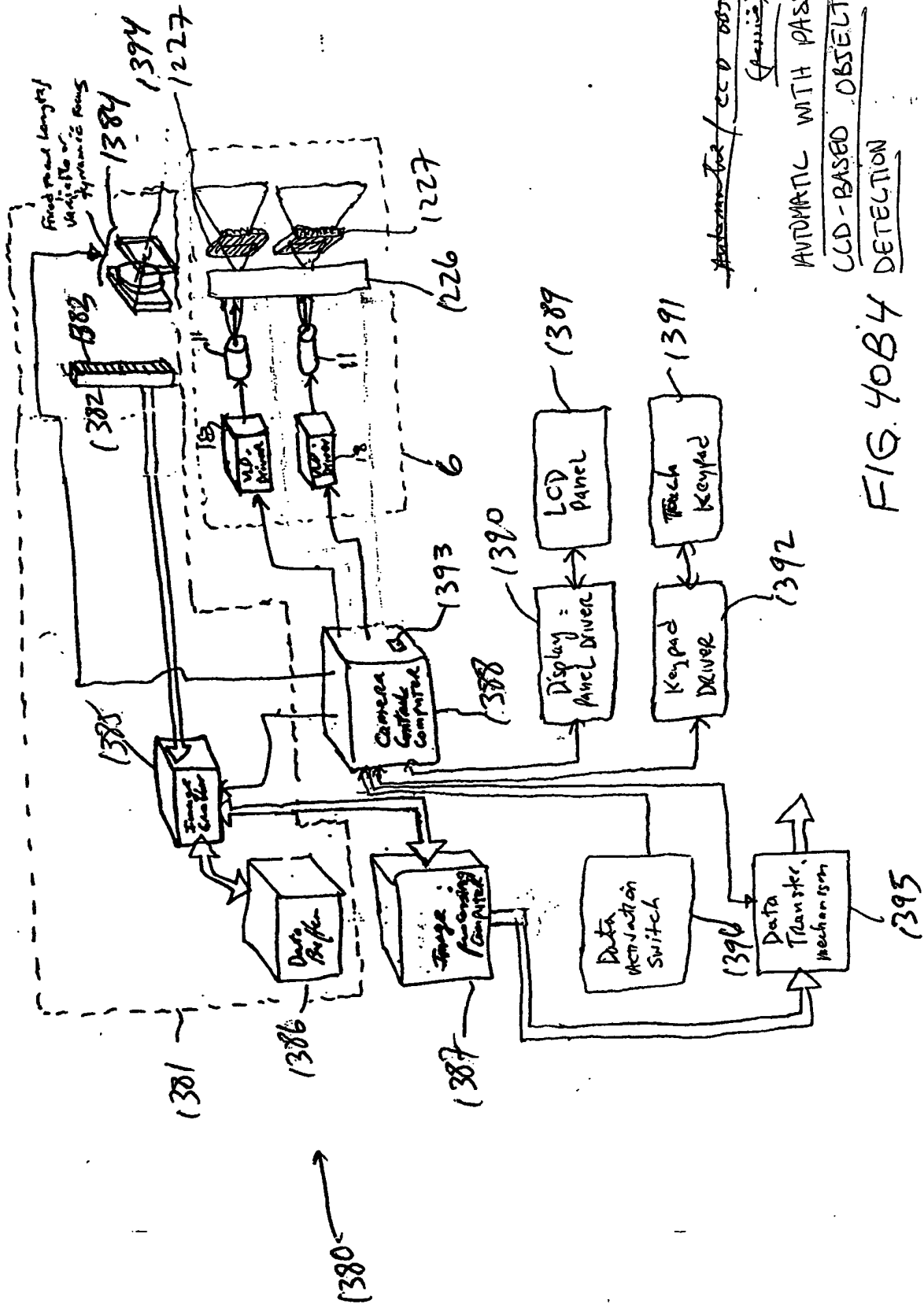
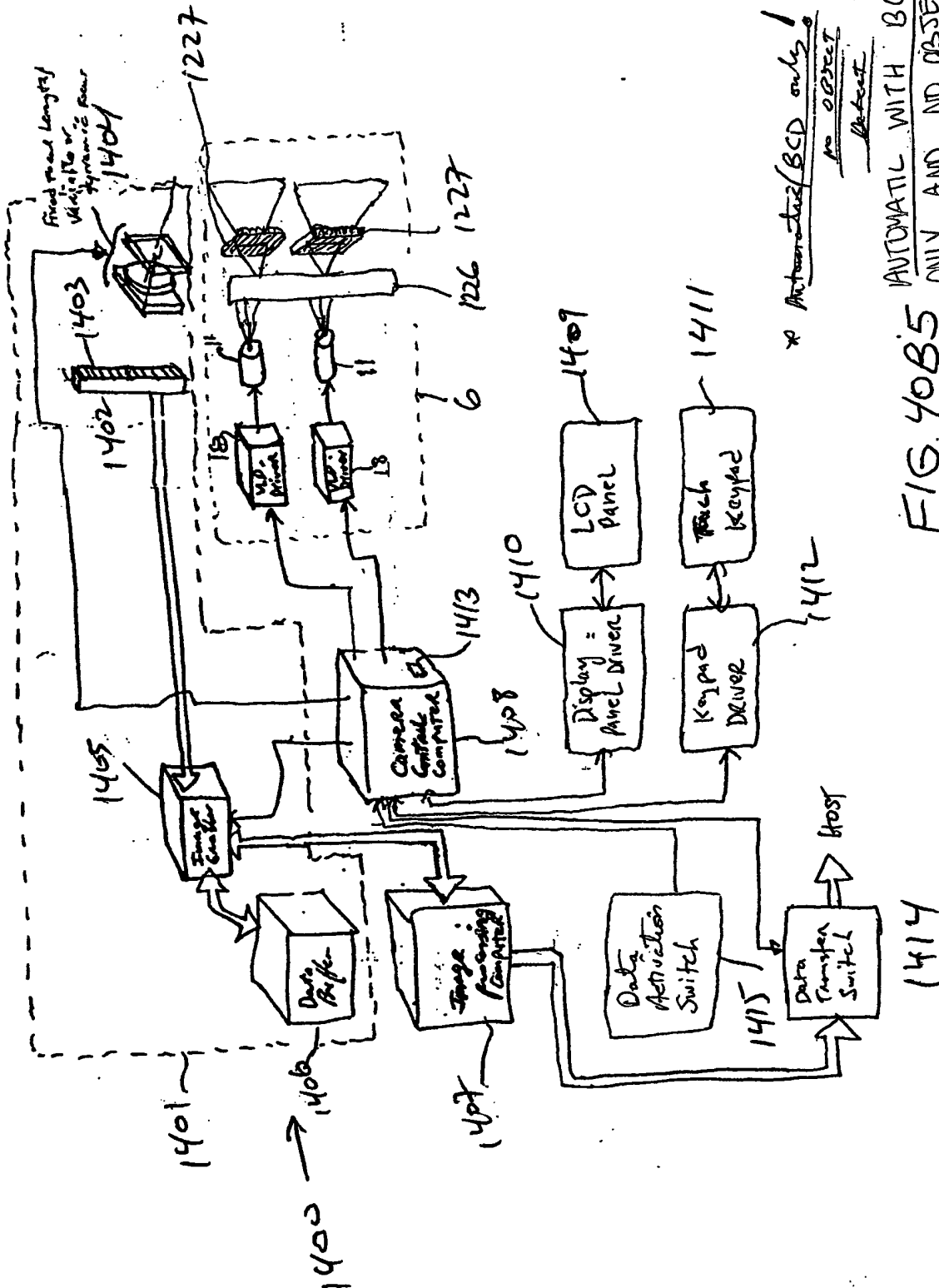
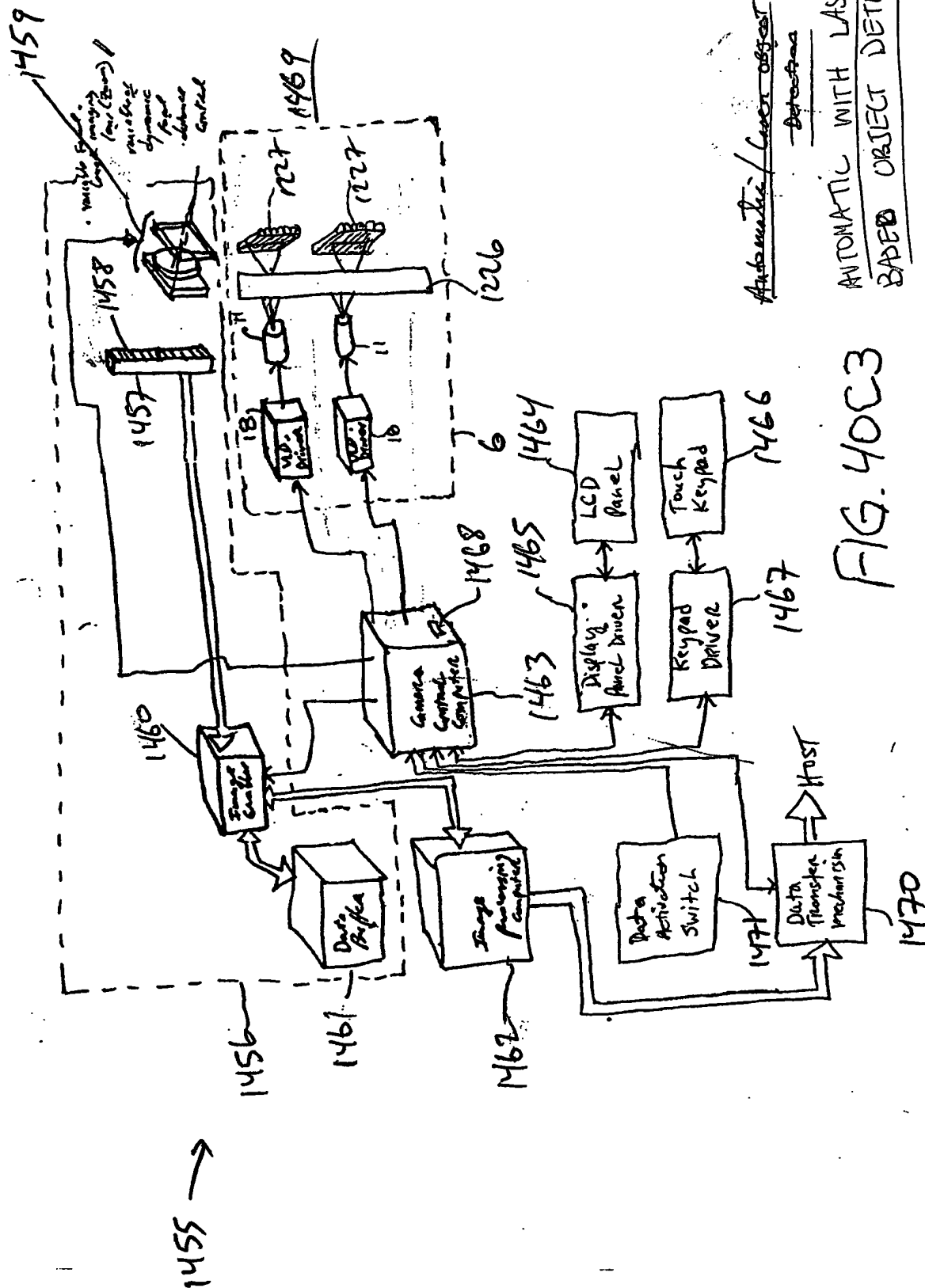


FIG. 40B3



Autonomous / CVD Object Subjects
(passive)

$$253/332$$


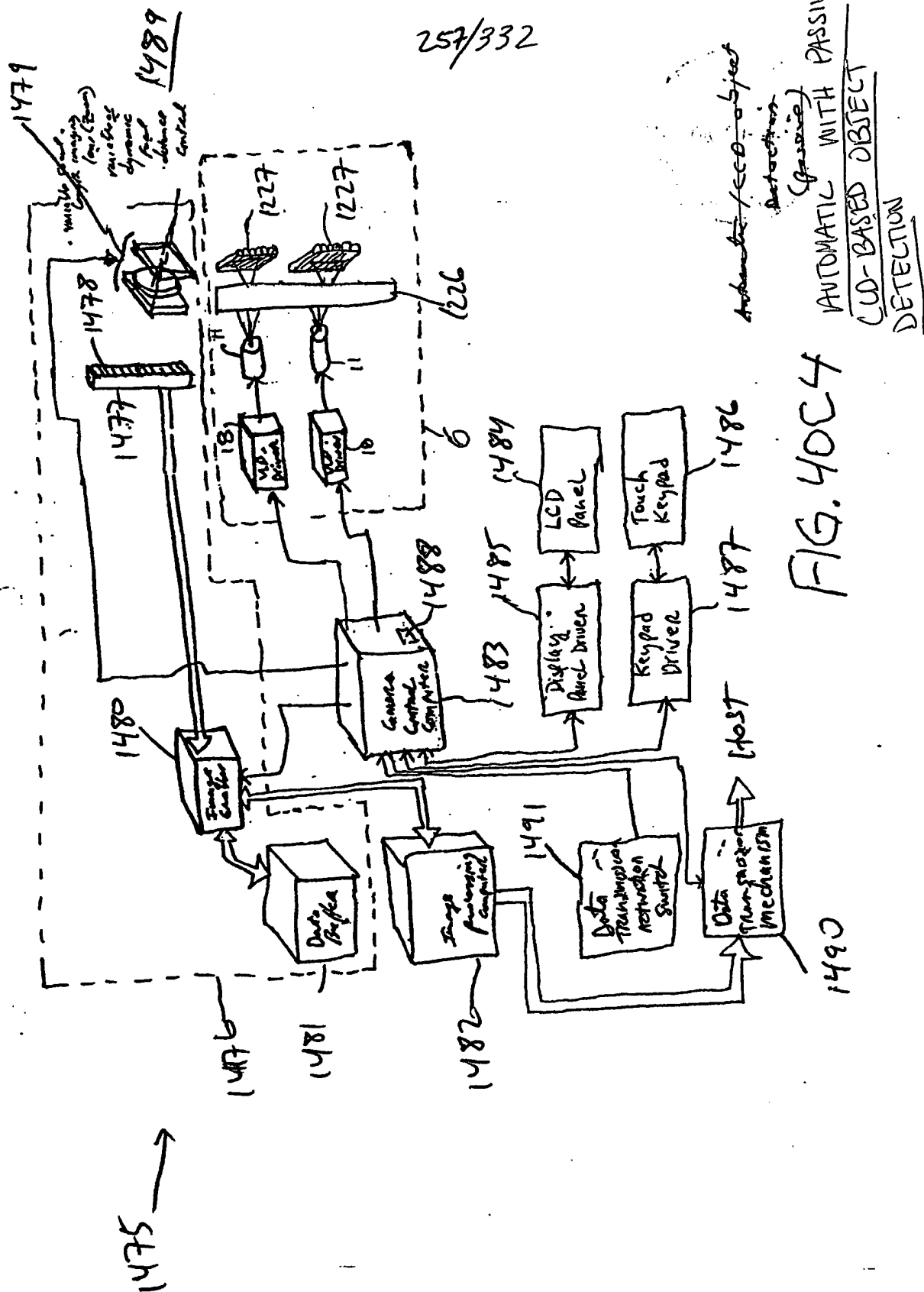


Automatic / Given object
- Detection

AUTOMATIC WITH LASER BASED OBJECT DETECTION

FIG. 40C3

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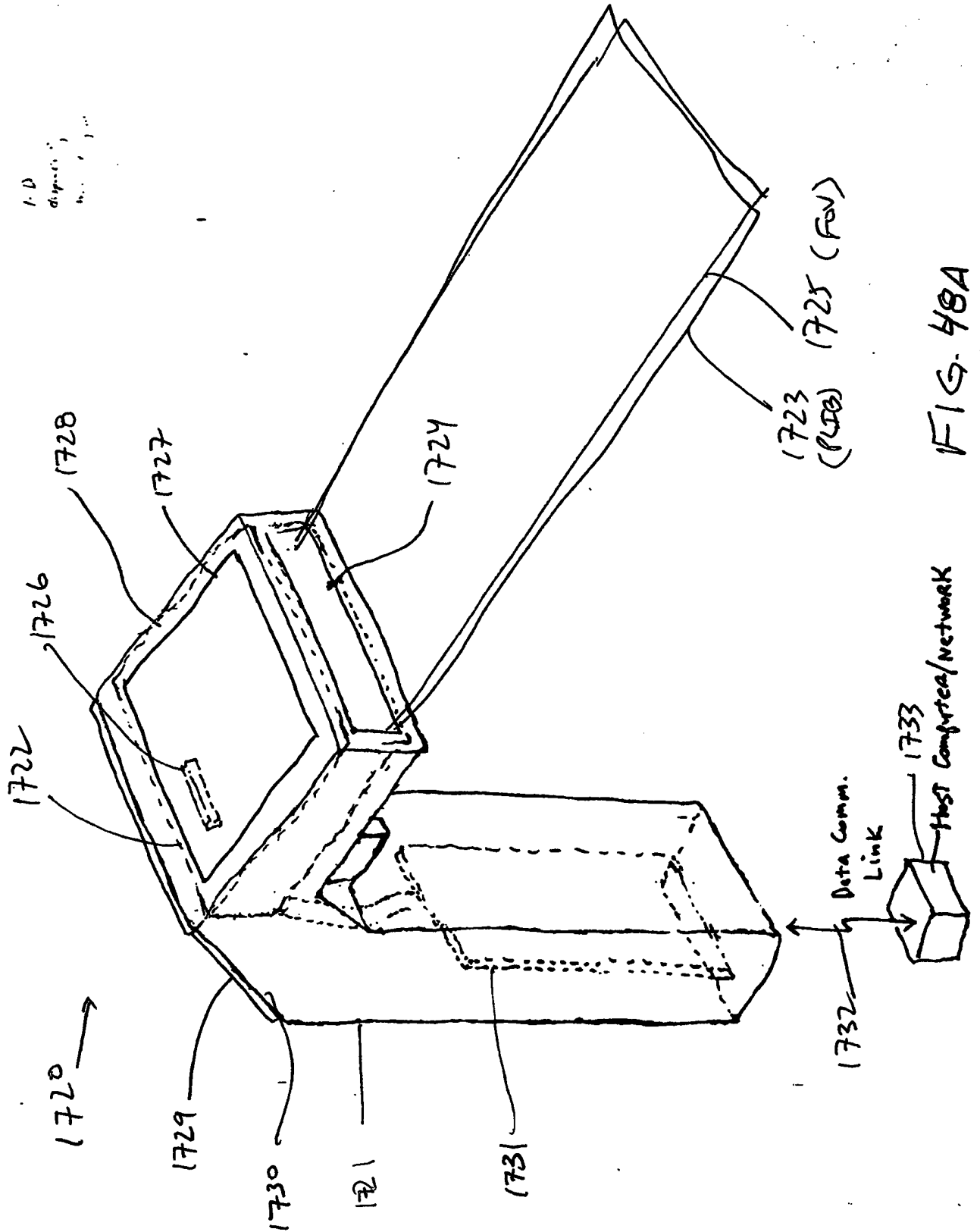


FIG. 48A

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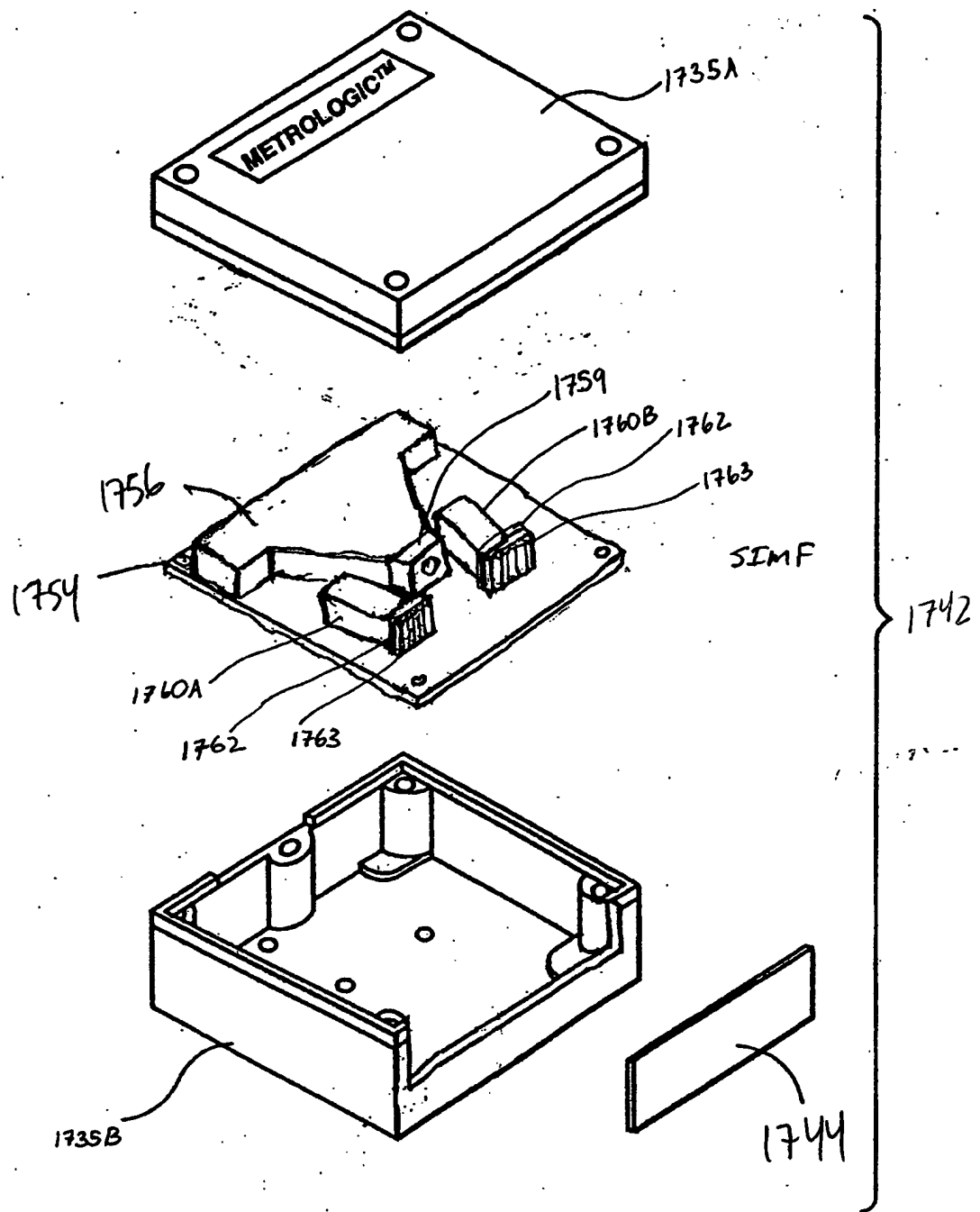


FIG. 49B

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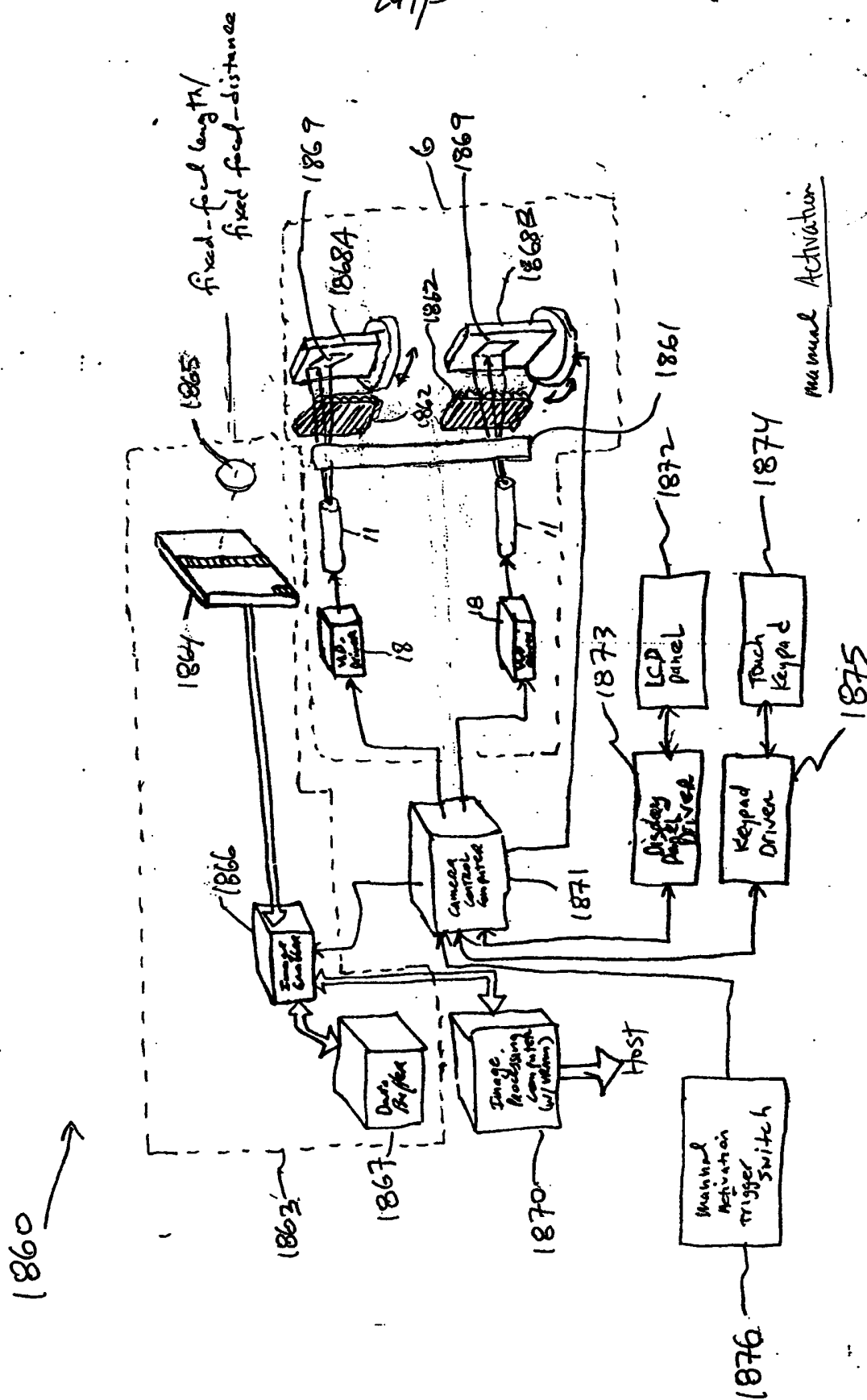


FIG. 53A1

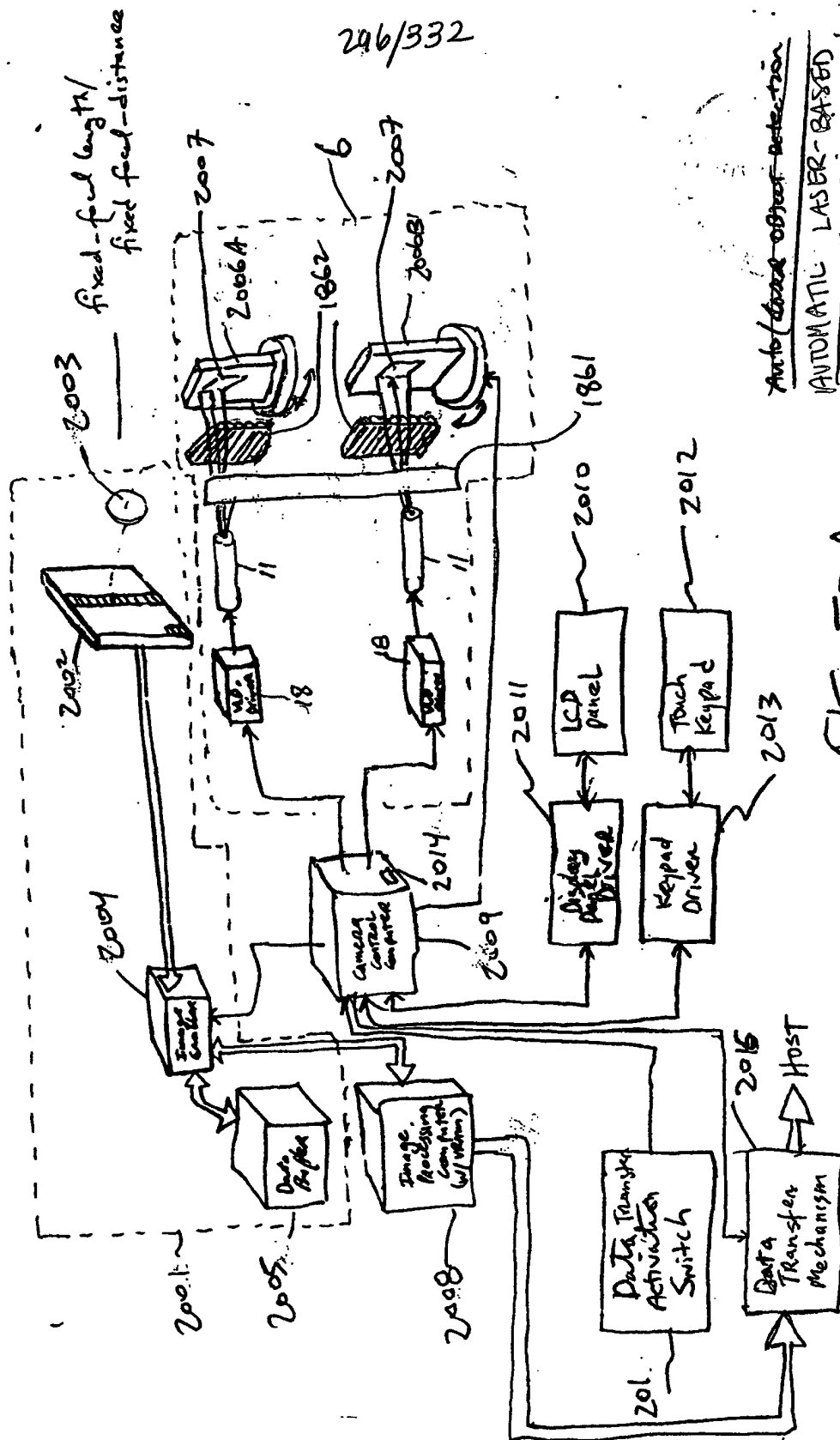
muscular Activation

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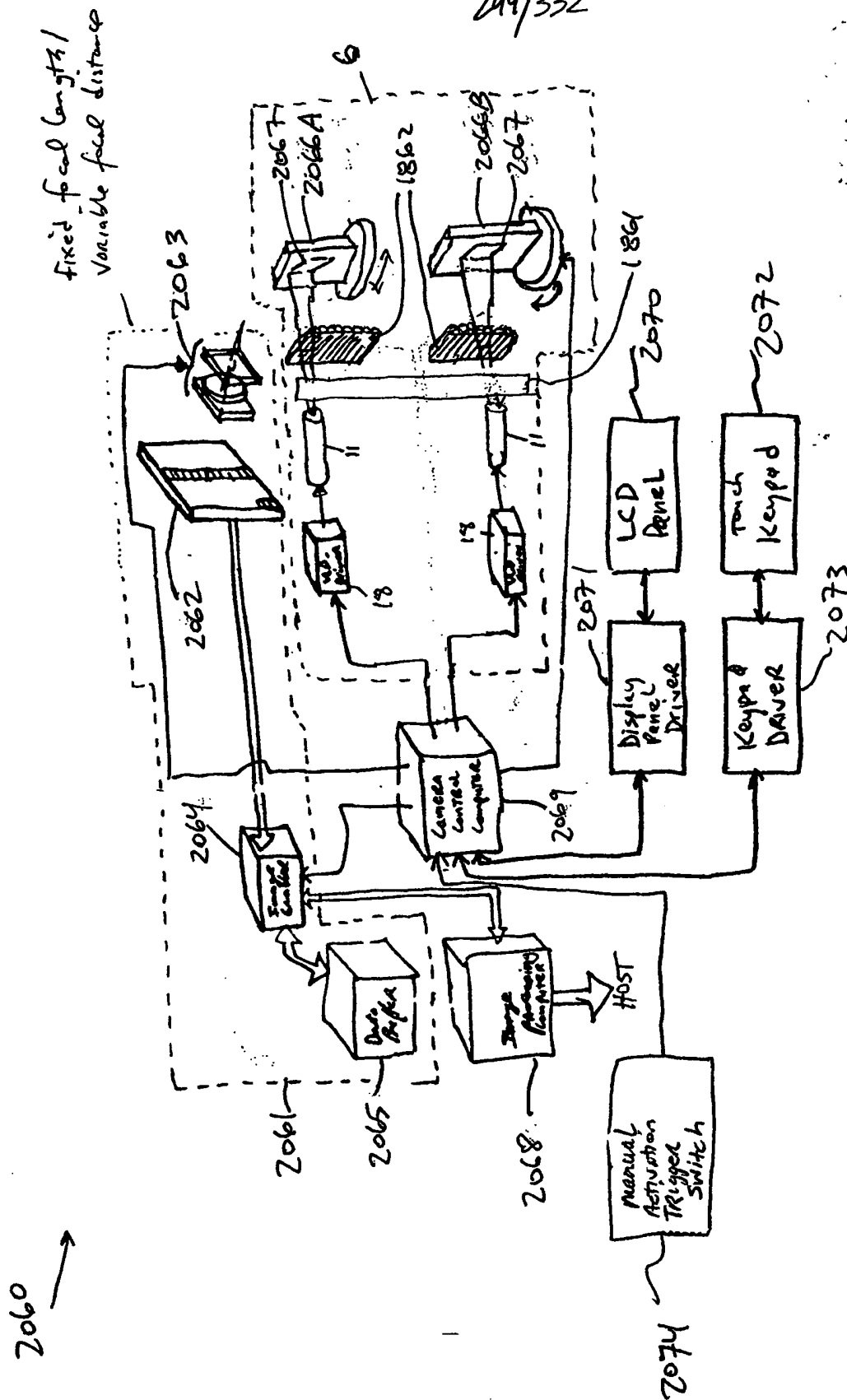
Auto (laser) offset detection
AUTOMATIC LASER-BASED
OBJECT DETECTION

FIG. 53A3

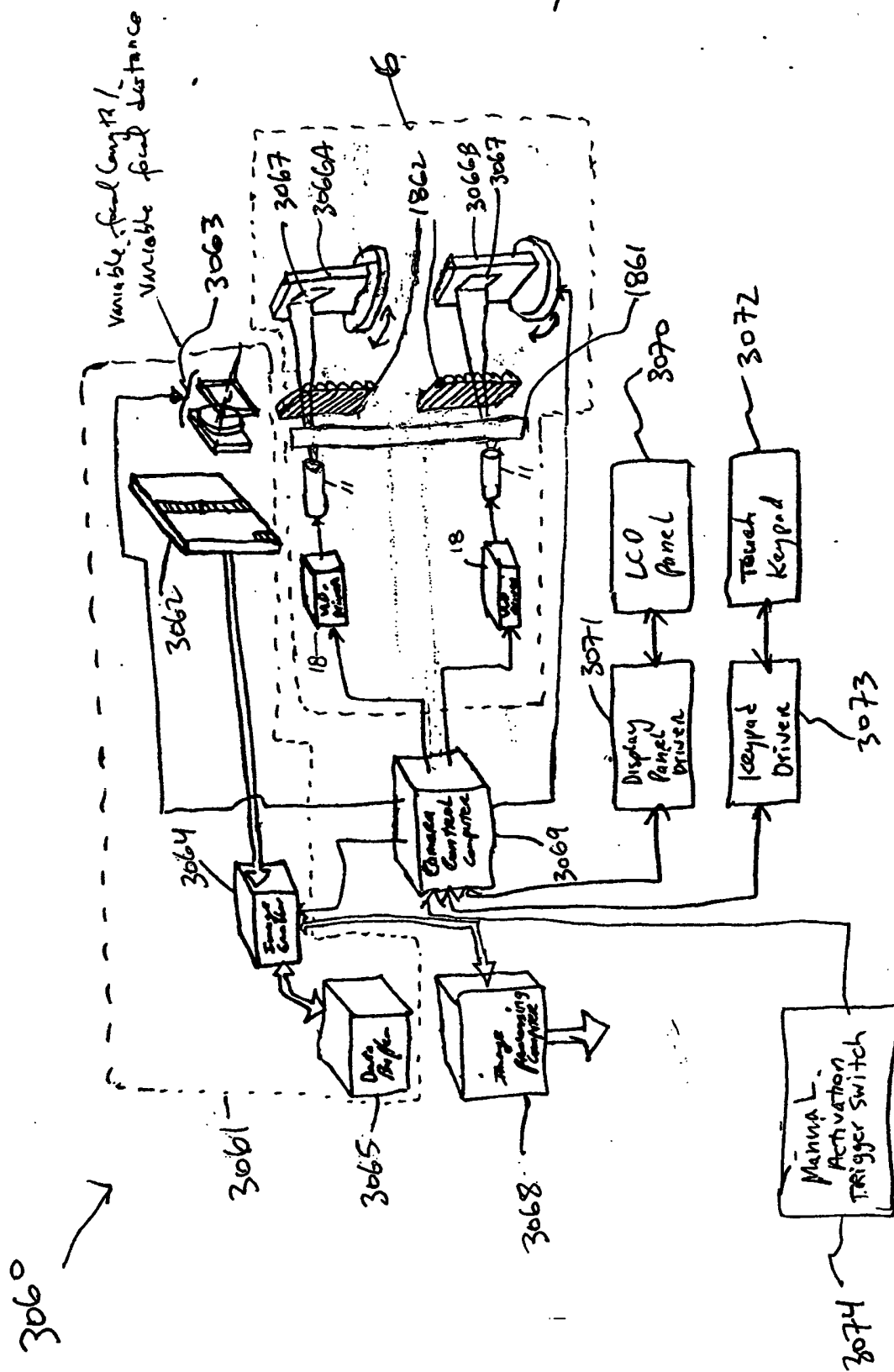
2002 →



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Manual Activation:

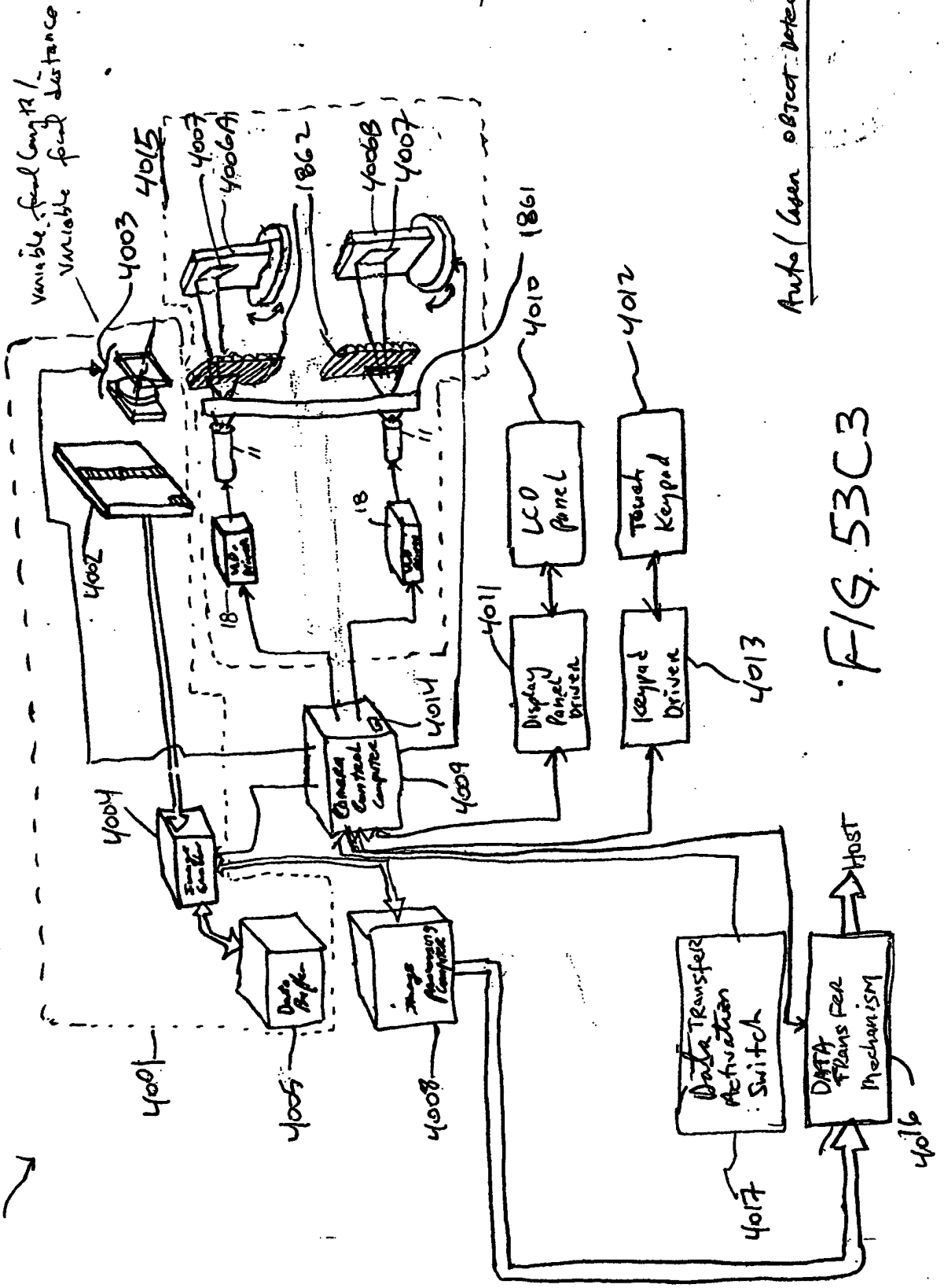


Manual Activation

FIG. 53C1

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4000
4001



Auto / User object detection

FIG. 53C3

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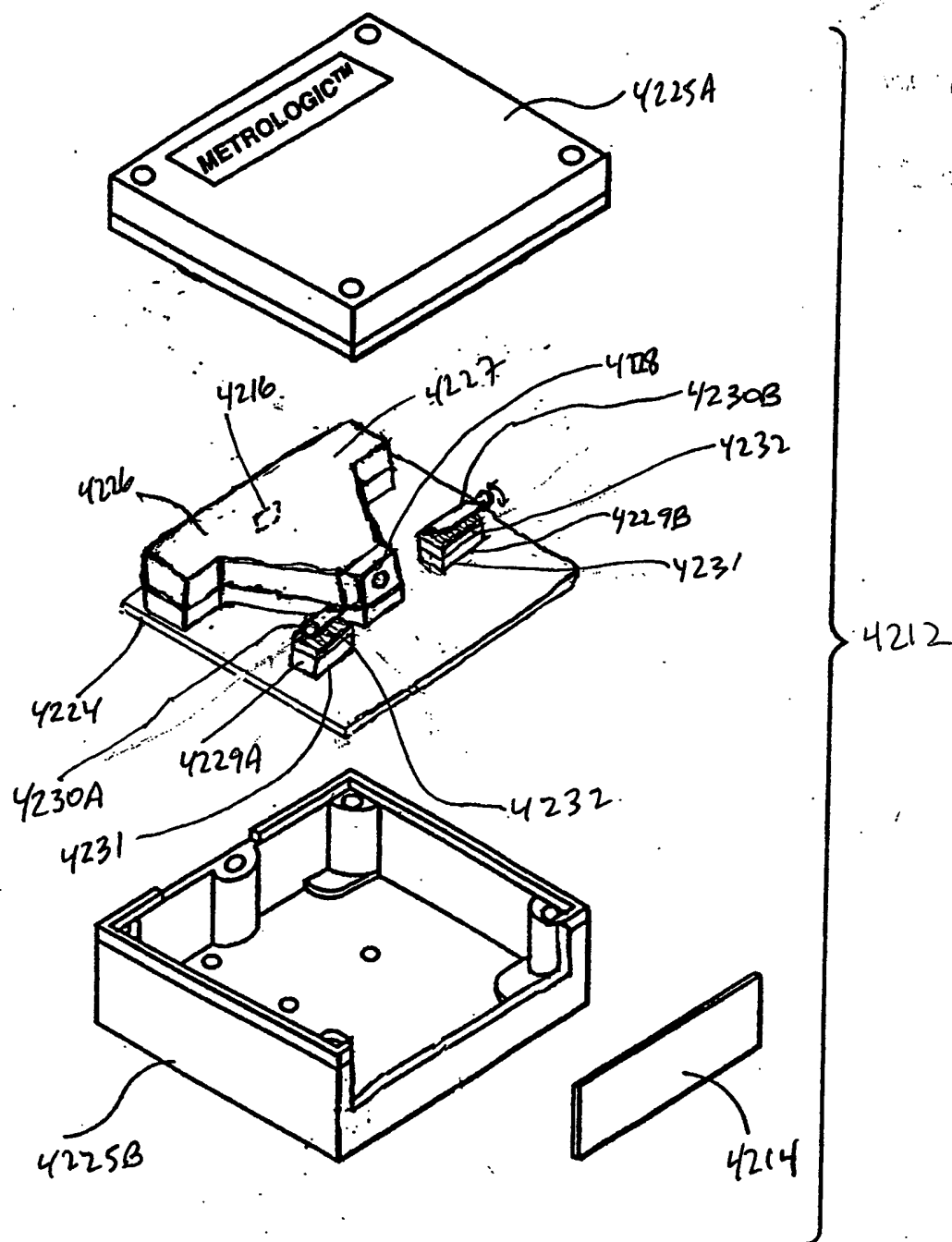


FIG. 59B

WILLD
Fig. 1E15A-15B

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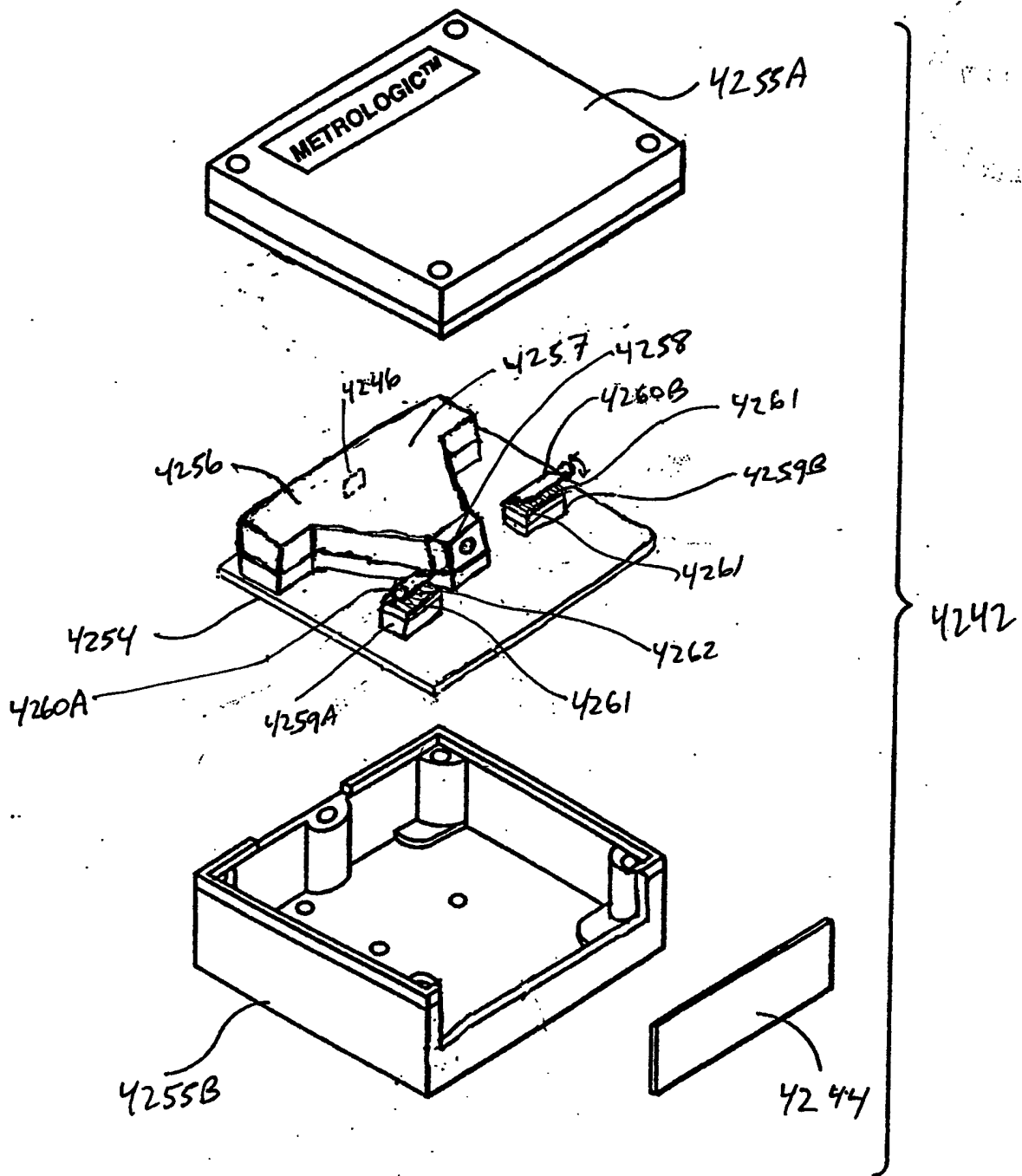


FIG. 60B

Etalon (Tang. phase mod.)
~~Etalon~~
 Fig. 1 I 17A-17B

4290
4270

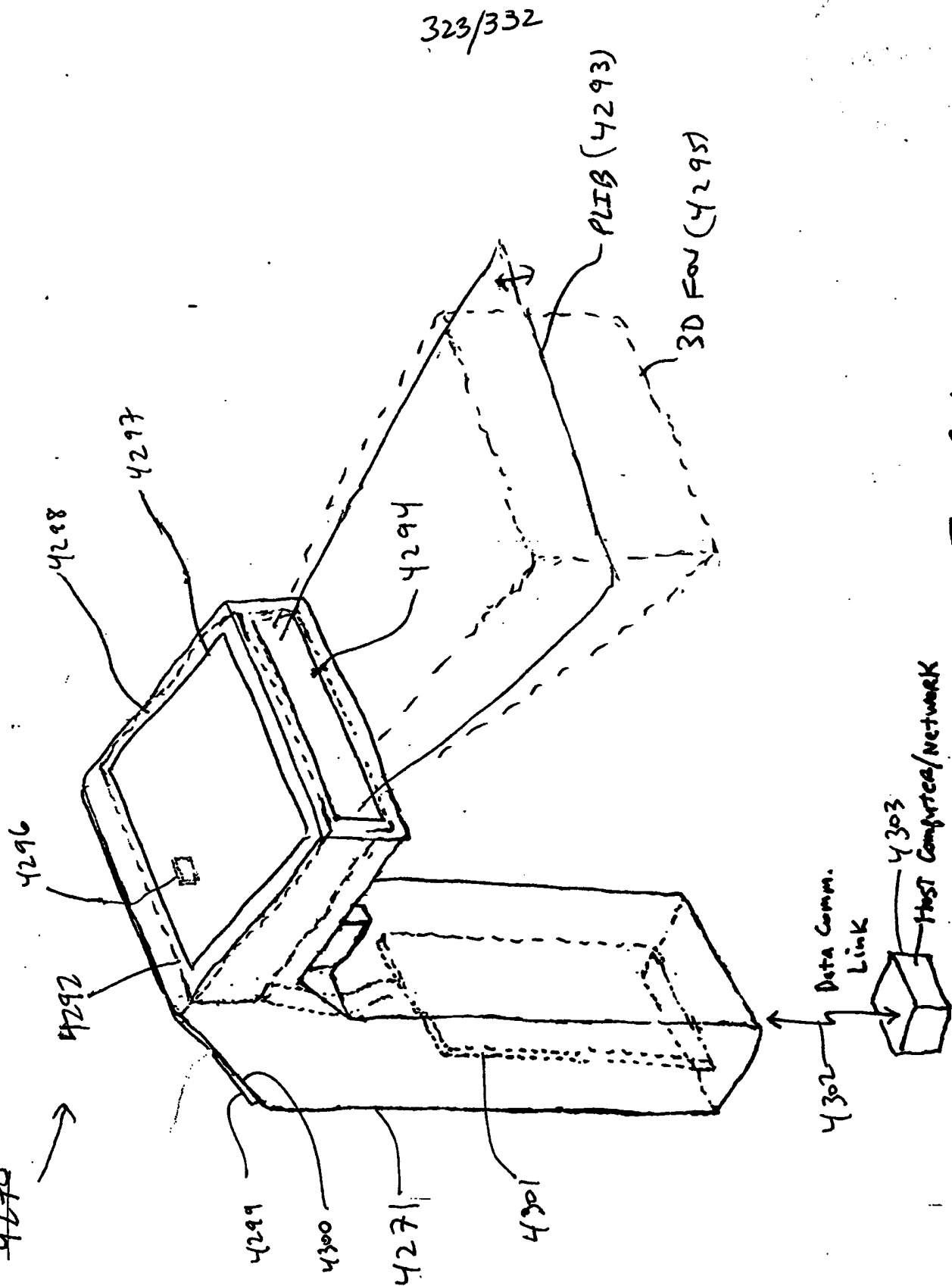


FIG. 61A

